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See publication: Articles in journals, papers in proceedings, or chapters in books are found in the publication cited. These publications may be in libraries or purchased from publishers or dealers.

SAE: Society of Automotive Engineers, Dept. HSL, 400 Commonwealth Drive, Warrendale, Pa. 15096. Order by title and SAE report number.

TRB: Transportation Research Board, National Academy of Sciences, 2101 Constitution Ave., N.W. Washington, D.C. 20418.

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Due to circumstances beyond our control, there
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HS-014 871

ON THE EVALUATION OF HUMAN LIFE IN ACCIDENT STUDIES

In various studies relating the economic costs of fatal accidents to the value of the work carried out by those involved, value of work has been measured by earned income, earned income less consumption, national income per head of the working population, or national income per head of the working population less consumption. Some theoretical implications of using each of these four different approaches are compared, and some inconsistencies noted particularly in results implied by the assumption that the value of work is measured by the wage rate. Of the four approaches, it is tentatively concluded that the adoption of national income per head of the working population has some advantages, provided that it is used to set a minimum value on the amount it is worth spending to prevent a fatal accident and not as an average value of life to be included in social cost benefit studies.

by P. B. Goodwin

Publ: Accident Analysis and Prevention v5 n4 p287-93 (Dec 1973)

1973 ; 9refs

French and German summaries.

Availability: See publication

HS-014 872

A CRITICAL ANALYSIS OF FEDERAL HIGHWAY SAFETY POLICY

It is contended that the most critical issues in highway safety throughout the world are policy-related: solutions are dependent upon policy commitments to achieve an optimum balance between risk, resources and mobility. Emphases on purely technological solutions and upon actions derived from emotional, intuitive policies are leading to large expenditures and disappointing results. A type of cost effectiveness approach is suggested, based upon specific policy goals in terms of maximum annual fatalities, available resources, and desired mobility. It is argued that for a given level of resources, the greatest reduction in fatalities will be derived if funds are used to implement corrective measures that have the lowest cost per life saved.

by R. F. Baker

Publ: Accident Analysis and Prevention v5 n4 p295-319 (Dec 1973)

1973 ; 17refs

French and German summaries.

Availability: See publication

HS-014 873

KONFIDENZINTERVALLE VON UNFALLZAHLEN (CONFIDENCE LEVELS FOR ACCIDENT STATISTICS)

The theoretical principles for finding the confidence limits of empirically obtained accident figures are shown. The conventional statistical estimates at present known from literature on the subject are valid only for high accident figures empirically obtained. The estimate here adduced is based on the Bayes statistical procedure. It is valid independently of the magnitude of the empirically obtained accident rate. It therefore offers the possibility of laying down confidence limits even for very

low empirically obtained accident figures. By utilizing the largely known Tables of the Chi square distribution it is relatively easy to determine the exact confidence limits. This estimate also enables a previous knowledge of the order of magnitude of an accident rate to be included in the calculation. This procedure can lead to a reduction in the span width of the confidence interval and thus to the defining of a statement. The practical application of the treatise leads to the compilation of tables and diagrams for the confidence limits of accident figures.

by W. Brilon

Publ: Accident Analysis and Prevention v5 n4 p321-41 (Dec 1973)

1973 ; 7refs

Text in German. English and French summaries.

Availability: See publication

HS-014 874

AN INVESTIGATION INTO THE RELATIONSHIP BETWEEN RAINFALL AND ROAD ACCIDENT FREQUENCIES IN TWO CITIES

A statistical analysis is made of the effect of moderate and heavy rainfall on accident frequencies recorded for London and Huddersfield, England, for one year. The analysis attempts to measure and compare these effects separately in: four specific periods of the day (night, rush hours, mid-day, and rest-of-day); four seasons of the year; and the complete period under study (whole year analysis). Statistical tables include confidence intervals.

by D. Haghghi-Talab

Publ: Accident Analysis and Prevention v5 n4 p343-9 (Dec 1973)

1973 ; 1ref

French and German summaries.

Availability: See publication

HS-014 875

UNINTENTIONAL SHOOTINGS, HIGHWAY CRASHES AND ACTS OF VIOLENCE--A BEHAVIOR PARADIGM

Characteristics of Vermont residents involved as shooters in unintentional shooting of all degrees of severity were compared with those of residents whom they shot and residents of same sex and similar age, most of whom owned guns but who were not involved in shooting incidents. In comparison with the other two groups, the shooters more often were previously known to the police, had arrests for violence, had arrests involving alcohol, and crashes and traffic citations during the previous three years and during their lifetimes. A behavior model is suggested, commonly involving alcohol, in which poor control of aggressive tendencies results in intentional acts of violence, and unintentional injury both on the highway and elsewhere.

by J. A. Waller; E. B. Whorton

Publ: Accident Analysis and Prevention v5 n4 p351-6 (Dec 1973)

1973 ; 14refs

Presented in briefer version at the Third Triennial Congress on Medical and Related Aspects of Motor Vehicle Accidents, New York, 29 May 1969. French and German summaries.

Availability: See publication

HS-014 876

A REMARK ON DRIVER ESTIMATION OF THE TIME OF COLLISION WITH AN ONCOMING CAR. RESEARCH NOTE

Modeling of driver behavior when passing is discussed in terms of an equation which defines the duration of time available before a potential collision as the value of the initial distance between vehicles, divided by the closing speed. It is shown that under certain conditions the observed interval of time given by the equation tends to exceed the actual time.

by A. Solomon

Publ: Accident Analysis and Prevention v5 n4 p357-9 (Dec 1973)

1973 ; 3refs

Availability: See publication

HS-014 877

ROAD AND RAIL CASUALTIES IN GREAT BRITAIN IN 1970. RESEARCH NOTE

Tables are presented which compare the road and rail casualty figures in Great Britain in 1970, based on the statistics given in published official reports, essentially relating the ratio of casualties to passenger miles or ton miles for freight. The figures indicate that in 1970, in terms of slight and serious injuries, public road transport was a safer form of travel than private road transport, and rail was safer than either form of road and rail transport in terms of fatal casualties. Rail transport is the safest for moving freight. On an "all casualties" basis, the indication is that movements by rail are over three times safer than movements by road.

by G. C. Jenkins

Publ: Accident Analysis and Prevention v5 n4 p361-5 (Dec 1973)

1973 ; 6refs

Availability: See publication

HS-014 878

AN ELEMENTARY AMBIGUITY IN ACCIDENT THEORY. RESEARCH NOTE

An ambiguity resulting from the partial ascertainment of accident data is discussed. Partial ascertainment may occur for such reasons as: certain events may not in fact be observable; a particular observation may be partially recorded according to a probability distribution, or different events may have different probabilities of being recorded. Focus is on the selection of data with unequal probabilities.

by C. D. Kemp

Publ: Accident Analysis and Prevention v5 n4 p371-3 (Dec 1973)

1973 ; 8refs

Availability: See publication

HS-014 879

A NOTE ON DIFFERENCES BETWEEN URBAN-RURAL AND SPEED-LIMIT CATEGORISATIONS OF ROAD ACCIDENT DATA. RESEARCH NOTE

Differences between urban-rural and speed limit categorisations of road accident statistics are examined. The results suggest the need to clarify more precisely what is differentiated in each dichotomy. The urban-rural concept appears to distinguish macroscopically between town and country, whereas speed limit bands may be more directly related to the dynamic traffic and driving situations. There is need to define categories that have both validity and relevance to the particular subject of the investigation.

by E. Weldon

Publ: Accident Analysis and Prevention v5 n4 p367-70 (Dec 1973)

1973 ; 7refs

Supported by the Science Res. Council.

Availability: See publication

HS-014 880

INVESTIGATION OF THE DYNAMIC IMPACT ON ROADSIDE OBSTACLES. EXECUTIVE SUMMARY

An impact evaluation program involving a variety of roadside structures was undertaken, results of which, with the applicability to operational practice, are provided in the official final report of the program. This Executive Summary provides an analysis of the immediate benefits accruing from this research. Based on the results of both full-scale testing and simulation activities, the following conclusions are made: base-bend signposts should be constructed of 2" diameter steel pipe; placement of which in concrete is not recommended; foam sodium silicate is an excellent candidate for an energy absorbing barrier but will require an internal structure to resist angle collisions; the barrier-angle breakaway end treatment is the most promising guardrail end treatment of those investigated and it is recommended that it be placed in the field for actual testing; all five MDSH standard curbs could be improved in redirectional ability; all of the curb/guardrail combinations examined are currently safe for operational installation although their redirectional ability could be improved; median dikes require flatter slopes than those currently in use and should be designed to promote containment with the median.

by E. C. Zobel; D. F. Dunlap; I. W. Kay; J. J. Blass; P. Groves; D. M. Fram

Wayne State Univ., Detroit, Mich.; Michigan Univ., Ann Arbor. Hwy. Safety Res. Inst.

1972 ; 14p

Prepared in cooperation with the Federal Hwy. Administration and the Michigan State Hwy. Commission. See also HS-014 881.

Availability: Wayne State Univ., Detroit, Mich. College of Engineering

HS-014 881

INVESTIGATION OF THE DYNAMIC IMPACT ON ROADSIDE OBSTACLES. FINAL REPORT

The impact performances of six types of roadside structures are presented. Nominal 2" diameter steel pipes are found to

preferable to both 2-1/2" steel pipes and 8 8 lb/ft flanged channel pipes for small base-bending signposts. A series of feasibility tests on the use of foamed sodium silicate blocks as energy absorbing barriers proved inconclusive; further research in the area is indicated, especially for angular redirection characteristics. An earthen mound guardrail end treatment, a sweep barrel end condition and a corrugated steel pipe end treatment for guardrails are found to be unsatisfactory. A barrier angle breakaway absorber guardrail and treatment, and an 8" radius curved W-beam guardrail end treatment are both promising but further investigation is advisable. Five MDSH standard curb configurations were subjected to simulated impacts and are found to affect vehicle motions as a function of height, face profile and surface texture. Eight common curb/guardrail combinations were evaluated in terms of vaulting potential; all are found to be safe provided specific guardrail height and setback guidelines are adhered to. The MDSH standard median dike profile is found to be unsafe and in need of flatter side slopes. Appendices are presented which contain detailed discussions of simulation modeling methods, test acceleration measurements, and roadside structure development.

by E. C. Zobel; D. F. Dunlap; I. W. Kay; J. J. Blass; P. Grote; D. M. Fram
Wayne State Univ., Detroit, Mich.; Michigan Univ., Ann Arbor. Hwy. Safety Res. Inst.
1972 ; 638p 102refs

Prepared in cooperation with the Federal Hwy. Administration and the Michigan State Hwy. Commission. See also HS-014 880.

Availability: Wayne State Univ., Detroit, Mich. College of Engineering

HS-014 882

VISUAL DEGRADATION IN RELATION TO SPECIFIC ACCIDENT TYPES. FINAL REPORT

Multiple regression analyses were conducted relating static and dynamic visual acuity, visual field, low illumination vision, glare recovery, lateral phoria, eye color and eyedness to six types of accidents: daytime, nighttime, frontal left or left front, right or right front, and left rear, rear or right rear. Age, sex and average annual mileage were included as control variables. Results of the analyses indicate average annual mileage is the best accident predictor except for rear accidents. Age is a significant predictor positively related to left rear, rear or right rear accidents. Of the vision variables dynamic visual acuity is the most consistent predictor. It is significant in daytime, left or left front and right or right front accidents. Individuals with poor vision experience more accidents. An appendix gives the Accident Information Coding Manual.

by A. Burg
California Univ., Los Angeles. Inst. of Transp. and Traf. Engineering
CONTRACT PH-86-68-2; GRANT Ref: AC-00015; Ref: CSA-13600

Rept. No. UCLA-ENG-7419 ; 1974 ; 58p 10refs
Prepared in cooperation with the Calif. Dept. of Motor Vehicles.

Availability: University of California, School of Engineering and Applied Science, Reports Group, Los Angeles, Calif. 90024

HS-014 883

STATE OF IOWA TRAFFIC RECORDS AND CRIMINAL JUSTICE INFORMATION SYSTEM (TRACIS). TRAFFIC RECORDS BATCH PROCESSING: DETAILED SYSTEM DESIGN SPECIFICATIONS

A detailed manual designed to create and maintain TRACIS (Traffic Records and Criminal Justice Information System) data base from the batch processing of traffic records input documents and Driver License File of Iowa is presented. The principal areas of programming are: programs. Data flow charts and sample forms are included. Input and file maintenance Criminal Justice Information System) data base from the batch processing of traffic design specifications include forms for: driver license, driver history, vehicle registration, change of identity, and accident reports, as well as uniform traffic citation and disposition, certificate of title, and receipt for notation of security interest. Traffic records output processing covers reports on: vehicle registration and titles issued; fees collected; weights and measures, vehicle fuel tax, and reciprocity violations; fatal accidents; violation/ accident statistics; safety and financial responsibility actions; driver licenses issued; traffic violations, dispositions, and sentences summary; and driver age/sex/restriction profile.

by M. L. Moore 05Systems Science Devel. Corp., McLean, Va.
1972 ; 285p

Prepared for the State of Iowa Traffic Records and Criminal Justice

Availability: State of Iowa Traffic Records and Criminal Justice, Office of the Comptroller, State Capitol Building, Des Moines, Iowa

HS-014 884

BICYCLES AND HIGHWAY SAFETY

Bicycle accidents constitute the fastest growing highway safety problem in the country. Bicycles need to be better integrated into the highway safety support system that works so well for motorized transportation. Confusion results from the lack of uniform laws concerning the rights and duties of bicyclists. Accident reporting in regard to injuries involving bicyclists is limited. Law enforcement, often lacking, needs to be directed towards violations associated with serious and fatal traffic accidents. Bicycle safety education is recommended for adults, parents, children, and motorists. Closer supervision of young childrens play is a must. Bicycle lanes need to be developed from the point of view of the bicyclist.

by M. E. Birnbaum
Publ: American Bicyclist and Motorcyclist p123ff (Feb 1974)
1973 ; 18p
Briefing presented to the National Hwy. Safety Advisory Committee, Washington, D. C., 27 Nov 1973.
Availability: See publication

HS-014 885

A GENERAL OVERVIEW OF PEDESTRIAN ACCIDENTS AND PROTECTION COUNTERMEASURES

In an attempt to provide a perspective on the allocation of efforts to reduce pedestrian injuries and fatalities, a general

overview of pedestrian accident statistics and protection countermeasures is presented. Traffic control, lighting, pedestrian/vehicle isolation, traffic flow planning, pedestrian education, high school driver education, accident-avoidance training, public education, and a discussion of possible vehicle modifications are included in the countermeasures presented. In general, evidence for countermeasure effectiveness is often lacking or conflicting, which suggests that systematic studies of a more scientific nature must be conducted in all countermeasure areas. However, based on the limited data available, human and environmental oriented programs appear to have greater potential for reducing pedestrian injuries and fatalities than vehicle design changes.

by T. O. Jones; B. S. Repa; J. L. Potgiesser
General Motors Corp., Warren, Mich. Engineering Staff
1974 ; 38p 77refs
Presented at the Third International Congress on Automotive Safety, National Motor Vehicle Safety Advisory Council, Dept. of Transp., San Francisco, 15-17 Jul 1974.
Availability: Corporate author

HS-014 886

BEFORE THE CRASH: HOW BIOMECHANICS REDUCES FATALITIES AND INJURIES

Biomechanics, the study of forces against the body is discussed. Safety devices such as seat belts, shoulder harnesses, energy absorbing steering columns, padded dash boards, side door beams, high penetration resistant windshield and air bags emanated from biomechanical studies. Further research progress in this field, including human tolerance studies, is presented. The air bag is discussed. It proved safe in frontal collisions, but doubtful in angular crashes or rollovers. Production of Experimental Safety Vehicles was expensive and impractical.

by S. Raphael
Publ: WARD'S Auto World v10 n6 p51-4, 56 (Jun 1974)
1974
Availability: See publication

HS-014 887

PLASTICS IN CARS

The use of plastics in cars has increased from 25 lbs in 1964 to almost 100 lbs today. Plastics are defined, and a brief history of their development is presented. Processing of plastic materials is discussed. The use of plastics as upholstery and head liner fabric, in steering wheels, radiator grilles, wheel trims, bearing materials, carburetor floats, and instrument panels are presented. Manufacturing considerations are discussed. Future considerations include a plastic bumper molded on to a steel armature, and a sports car of plastic sandwich construction.

by A. Shanks
Publ: Autocar v141 n4046 p20-3 (4 May 1974)
1974
Availability: See publication

HS-014 888

AUTOMOBILE FACTS AND FIGURES 1973/74

Statistics and issues related to motor vehicles and their use are presented as a ready reference for background information. Annual motor vehicle sales from U. S. plants are tabulated for 1942-1973. Types of motor vehicle sales, registration, highway use, fatality rates, car buying trends, motor use taxes, state and federal special motor vehicle taxes paid in 1973, export and import of motor vehicles, material consumption, vehicle miles traveled on U. S. roads and highways in 1972, number of cars in operation, age of cars in operation are among the items tabulated. Short informative articles on fuel economy, use of materials from recycled vehicles, types of roads in use, interstate highway costs and benefits, needed highway improvements, and highway trust fund are presented.

Motor Vehicle Manufacturers Assoc. of the United States, Inc., Detroit, Mich.
1974 ; 73p refs
Availability: Corporate author

HS-014 889

INSTRUCTOR'S MANUAL FOR DWI COUNTERATTACK

New York State's pilot DWI (Driving While Intoxicated) counterattack programs are presented in an instructors manual. It is based on an academic approach developed in Phoenix by Arizona State University and Teachers College of Columbia University. Background materials and selection of instructors, course materials and organization, operating guidelines, test packet, scoring and interpretation, counseling services, counseling profile, and program evaluation are discussed. The objective of the course is behavioral modification. An attitude scale developed reveals the course has a measurable effect in reducing DWI offenses.

American Automobile Assoc., Washington, D. C. Traf. Engineering and Safety Dept.
1972 ; 125p
Availability: Availability Corporate author

HS-014 890

THE PRODUCTION HELP BUMPER: EVOLUTION, TESTING AND EVALUATION

A High Energy Level Pneumatic (HELP) bumper system, designed to fit all transit coaches presently made by prime bus manufacturers is presented. It is adaptable for retrofit to older coaches. Vehicle tests have demonstrated 6 mph barrier crash capability and 10 mph collisions into pre-1973 passenger cars with no damage to bus or HELP bumper. Collisions with a 1974 passenger car at speeds to 8.5 mph resulted in no damage to either vehicle.

by J. E. Gieck; D. A. Weitzenhof; M. S. Prichard;
Firestone Tire and Rubber Co., Akron, Ohio
Rept. No. SAE-740062 ; 1974 ; 28p 12refs
Presented at the Automotive Engineering Congress, Detroit, 25 Feb - 1 Mar 1974.
Availability: SAE

November 29, 1974

HS-014 891

HS-014 891

TRANSIENT TIRE PROPERTIES

This paper identifies and analyzes steady-state and transient tire properties affecting vehicle directional response characteristics. The study is limited to the relationship between lateral force and slip angle. It shows fundamental differences between steady-state and transient properties. Tire transient properties are described by a force-slip angle loop with cornering stiffness and dynamic lateral force offset as parameters. Cornering stiffness is presented as a variable that changes with speed and steer rate. An interrelationship between cornering stiffness and dynamic lateral force offset resulting from the time lag between lateral force and slip angle is shown. Ramp steering techniques for measuring transient tire properties on a test trailer and on an external drum machine are described. A method for transient tire data for computer simulations of vehicle transient steer maneuvers is shown. Subjective evaluations of vehicle equipped with different tires are described and compared with results of evaluations of 21 foreign and domestic vehicles. The significance to vehicle handling of tires having different characteristics, as determined by subjective evaluations in a lane change maneuver, is shown. Correlation between measurements of tire properties and subjective evaluations may be feasible with additional work utilizing a larger test sample size, improved test devices, and additional test criteria.

by W. Bergman; C. Beauregard
Firestone Tire and Rubber Co., Dearborn, Mich.
Rept. No. SAE-740068 ; 1974 ; 16p 21refs
Presented at the Automotive Engineering Congress, Detroit, 25
Feb - 1 Mar 1974.
Availability: SAE

HS-014 892

DEVELOPMENT OF ALUMINUM ALLOYS FOR BODY SHEET

A study has been made of the various alloys for body sheet. These include the non-heat-treatable Al-Mg alloys and heat-treatable alloys of the Al-Mg-Si and Al-Cu-Mg types. Tests have shown that each alloy has a different combination of properties with no alloy excelling in all characteristics. At this stage in the development of aluminum body sheet, it would appear that the Al-Cu-Mg alloys 2036 and X5020 should be preferred over other types for general body sheet application. Where Lueder bands can be tolerated, Al-Mg alloys such as 2022 and X5085 offer an advantage of superior formability and are recommended for use as inner stiffening panels and supports.

by W. A. Anderson; R. D. Blackburn; B. S. Shabel
Aluminum Co. of America, Pittsburgh, Pa.
Rept. No. SAE-740077 ; 1974 ; 7p 5 refs
Presented at the Automotive Engineering Congress, Detroit, 25
Feb - 1 Mar 1974.
Availability: SAE

HS-014 893

CONICITY AND PLY STEER EFFECTS ON VEHICLE PERFORMANCE

Conicity and ply steer are lateral forces developed by tires whose importance has surfaced with radial tire popularity. Un-

derstanding their significance is enhanced by knowing their dependence on measurement and usage parameters and tire construction features. Of the two tire forces, conicity and ply steer, conicity seems to be the most troublesome due to its relationship to vehicle pull as opposed to ply steer effects which go unnoticed in normal applications. Their effects on vehicle performance are manifested in vehicle pull and vehicle drift or dog tracking. Knowing their individual vehicle performance characteristics offers insight into handling related field-service problems more effectively.

by B. E. Lindenmuth
Firestone Tire and Rubber Co., Akron, Ohio
Rept. No. SAE-740074 ; 1974 ; 13p 3refs
Presented at the Automotive Engineering Congress, Detroit, 25
Feb - 1 Mar 1974.
Availability: SAE

HS-014 894

FINISHING CONSIDERATIONS FOR ALUMINUM BODY SHEET ALLOYS

Finishing of aluminum is discussed with emphasis on its compatibility with existing systems employed for the repair, pretreatment, and electropainting of steel auto body components. Included is a comparison of the finishing practices used to repair fabricating damage on steel versus aluminum components. The need to modify the chemical pretreatment and electrodeposition priming systems presently used for steel bodies is minimal with aluminum or bimetallic assemblies. Initial results from ongoing laboratory finishing studies indicate that no major alterations of either equipment or processing techniques will be required to accommodate aluminum as an auto body material.

by F. W. Baker; M. K. McGinnis
Aluminum Co. of America, Pittsburgh, Pa.
Rept. No. SAE-740079 ; 1974 ; 8p 4refs
Presented at the Automotive Engineering Congress, Detroit, 25
Feb - 1 Mar 1974.
Availability: SAE

HS-014 895

OPTIMIZATION OF VEHICLE COOLING SYSTEMS

This paper describes an approach to vehicle cooling system design which combines experimental work on installation characteristics with a predictive technique for the isolated heat exchanger performance in an optimization procedure, whereby the cooling matrix may be matched to the installation, according to chosen value criteria. The installation system characteristic is evaluated using calibrated gauzes of varying resistance in place of the conditions. A simple mathematical model of a vehicle cooling vehicle cooling matrix. Airflows through the gauzes are measured for various vehicle operating system is proposed by which the predominant system behavior can be interpreted. The measured examples are discussed in terms of this model. The model has indicated some areas of potential system improvement.

by C. J. Davenport; R. A. Beard; P. A. J. Scott
Associated Engineering Developments Ltd., North Rugby, Warwick (England); COVRAD Ltd., Coventry, Warwick (England)
Rept. No. SAE-740089 ; 1974 ; 16p 5refs
Presented at the Automotive Engineering Congress, Detroit, 25
Feb - 1 Mar 1974.
Availability: SAE

HS-014 896

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HS-014 896

A VEHICLE HEADWAY CONTROL SYSTEM USING Q-BAND PRIMARY RADAR

Work currently being carried out at the Lucas Group Research Centre into the control of vehicle headway using Q-band primary radar is reported. Earlier work is described in which a "saw-tooth" frequency-modulated continuous wave radar system and analog controller were fitted to a Ford Zodiac with automatic transmission and used to investigate the viability of such a system. This is compared with later work in which a miniature radar of improved performance and a digital microprocessor control system are fitted to a Triumph. The latter approach is enabling several types of control law and radar modulation parameters to be tried so that the overall ability of primary radar systems to cope with varying road conditions can be ascertained.

by A. P. Ives; P. M. Jackson
Lucas (Joseph) Ltd., Shirley, Warwick (England). Group Res. Centre
Rept. No. SAE-740097 ; 1974 ; 10p 4refs
Presented at the Automotive Engineering Congress, Detroit, 25 Feb - 1 Mar 1974. Supported by the Transport and Road Res. Lab., England.
Availability: SAE

HS-014 897

PROXIMITY MEASURING FOR USE IN COLLISION DETECTION SYSTEMS

Various methods available for proximity measuring are described and evaluated, resulting in the choice of radar as the best method available. Drawbacks of radar are recognized, however, and its major liability is the production of a possible health hazard in the form of microwave radiation. Limits imposed by the U. S. government are presented and compared to values obtained from a proposed system.

by P. Tartaglia
Massachusetts Univ., Amherst
Rept. No. SAE-740098 ; 1974 ; 5p 5refs
Presented at the Automotive Engineering Congress, Detroit, 25 Feb - 1 Mar 1974.
Availability: SAE

HS-014 898

ZINC PHOSPHATE PRETREATMENT SYSTEMS FOR ALUMINUM-STEEL ASSEMBLIES

The characteristics and composition of zinc phosphate coatings on aluminum and steel are presented, and practical considerations of the transition from steel to aluminum components are listed. Problem areas discussed include galvanic corrosion, underpaint quality, surface finish, electropainting, and new paint surfaces. It is found that precautions are necessary to prevent galvanic corrosion, and the effectiveness of paints, sealants, tapes, gasketing, and other protectors is enhanced with a zinc phosphate coating on dissimilar surfaces. Zinc phosphate application also improves adhesion of subsequently applied paint film, reduces or eliminates surface finish problems, reduces surface conductivity of aluminum and

uniformalizes the electropainting characteristics of aluminum and steel.

by M. A. Kuehner
Amchem Products, Inc., Ambler, Pa.
Rept. No. SAE-740099 ; 1974 ; 6p 2refs
Presented at the Automotive Engineering Congress, Detroit, 25, Feb - 1 Mar 1974.
Availability: SAE

HS-014 899

PRIMING OF BIMETALLIC ASSEMBLIES

Good painting practices for use with galvanized steel-steel and aluminum-steel assemblies are presented using solvent-type and electrodeposition-type primers. Associated problems and their effects are discussed. It is found that paint priming systems available in solvent type and electrodeposition types are being used successfully on multiple metal substrates of steel, galvanize, and aluminum. It is noted that aluminum provides a substrate, readily painted and corrosion resistant. Galvanic corrosion failure is a problem with bimetal assemblies. The use of galvanized steel or aluminum gives little corrosion failure on the painted galvanized or aluminum part, but may increase potential for failure on the adjacent painted steel areas. Electrodeposition primers deposit coatings of varying thickness over galvanize, aluminum, and steel. It is recommended that future paint systems be evaluated for effect upon bimetal assemblies.

by F. M. Loop
PPG Industries, Inc., Pittsburgh, Pa.
Rept. No. SAE-740100 ; 1974 ; 9p 8refs
Presented at the Automotive Engineering Congress, Detroit, 25 Feb - 1 Mar 1974.
Availability: SAE

HS-014 900

THE PREVENTION OF GALVANIC CORROSION IN BIMETALLIC ASSEMBLIES

Maintenance and design used to prevent galvanic corrosion in bimetallic assemblies is discussed. It is noted that metal combinations leading to excessive corrosion should be avoided in the design phases. Use of metallic coatings, insulators, sealers, and other nonconductive materials is recommended with susceptible metal combinations. Consideration is given to fabrication techniques, methods for joining bimetallic assemblies, and means for minimizing exposure to corrosive environments. Statistical analysis of the occurrence and prevention of galvanic corrosion is included, and suggestions for metal selection are made. Engineering and physical design of the bimetallic assembly is discussed.

by L. C. Rowe
General Motors Res. Labs., Warren, Mich.
Rept. No. SAE-740101 ; 1974 ; 10p 12refs
Presented at the Automotive Engineering Congress, Detroit, 25 Feb - 1 Mar 1974.
Availability: SAE

HS-014 901

DESIGN AND DEVELOPMENT OF A VARIABLE VALVE TIMING (VVT) CAMSHAFT

The design, fabrication, bench tests and engine durability tests of a variable valve timing (VVT) camshaft unit incorporating splines to allow the intake cams to move relative to the exhaust cams is discussed. Preliminary test data from a 350 CID (5700 cu. cm.) engine fitted with the VVT camshaft are presented noting durability and emissions. It is found that mass emissions of oxides of nitrogen are substantially reduced from standard valve timing values with 45 degree advance of the intake cam, and mass emissions of hydrocarbons and carbon monoxide and the brake specific fuel consumption values are essentially unaffected by intake valve timing changes. Conclusions agree with results of the single cylinder engine studies of Siewert. Study demonstrates that a VVT camshaft can be designed to fit into the space now occupied by a standard camshaft in a high production V-8 engine.

by C. A. Schiele; S. F. DeNagel; J. E. Bennethum
General Motors Corp., Warren, Mich. Environmental
Activities Staff; General Motors Res. Labs., Warren, Mich.
Rept. No. SAE-740102; 1974; 10p 6refs
Presented at the Automotive Engineering Congress, Detroit, 25
Feb - Mar 1974.
Availability: SAE

HS-014 902

OPTIMIZING ENGINE PARAMETERS WITH EXHAUST GAS RECIRCULATION

An engine dynamometer and vehicle study is described which defines the relationship between the engine parameters of exhaust gas recirculation (EGR) rate, air-fuel ratio (A/F) and spark timing. It is found that increasing the spark advance with increasing EGR rates will minimize losses in fuel economy and vehicle drivability while achieving significant reductions in oxides of nitrogen emissions. It is noted that this approach is limited by deterioration in hydrocarbon (HC) emission control, which can be minimized by spark retard but with a loss in fuel economy. It is determined that the A/F must be tailored to maintain good combustion for HC emission control without excessive richness and loss of carbon monoxide emission control.

by J. J. Gumbleton; R. A. Bolton; H. W. Lang
General Motors Corp., Warren, Mich. Engineering Staff
Rept. No. SAE-740104; 1974; 11p 7refs
Presented at the Automotive Engineering Congress, Detroit, 25
Feb - 1 Mar 1974.
Availability: SAE

HS-014 903

EXTENSION OF THE LEAN MISFIRE LIMIT AND REDUCTION OF EXHAUST EMISSIONS OF AN SI ENGINE BY MODIFICATION OF THE IGNITION AND INTAKE SYSTEMS

Extension of the lean misfire limit air-fuel ratio of a spark ignition engine by modification of the intake and ignition systems is discussed. The effects of long duration spark, extended spark plug gap projections and gap widths, and a vaned collar intake valve are reported. These modifications allow for reliable operation up to air-fuel ratios of 24:1. Experimental

apparatus and procedure used in this study are described. Conclusions are drawn concerning the optimization of the various modifications to extend the lean misfire limit and reduce the exhaust emissions. All modifications extend the lean misfire limit, but increased gap width has the most profound effect. In all cases, the exhaust emissions are reduced by extension of the lean misfire limit.

by T. W. Ryan, 3rd.; S. S. Lestz; W. E. Meyer
Pennsylvania State Univ., University Park
Rept. No. SAE-740105; 1974; 10p 17refs
Presented at the Automotive Engineering Congress, Detroit, 25
Feb - 1 Mar 1974. Sponsored by the Environmental Protection
Agency.
Availability: SAE

HS-014 904

DEVELOPMENT OF INTERSTATE MOTOR CARRIER NOISE REGULATIONS

Discussion and analysis of the technical information on noise generation, developed by the interagency task force and public docket is presented, and made available to the government for development of a regulatory strategy. Initial decisions have been made regarding federal regulation of noise generated by motor carrier operations subject to the Noise Control Act of 1972. Data on the character of noise generated by interstate motor carriers are presented, and bases for decisions are cited. High-speed roadside noise surveys are described. Tire noise research findings are studied. Development of improved tires is recommended.

by W. H. Close
Department of Transp., Washington, D. C.
Rept. No. SAE-740106; 1974; 6p 21refs
Presented at the Automotive Engineering Congress, Detroit, 25
Feb - 1 Mar 1974.
Availability: SAE

HS-014 905

INSTRUMENTS FOR ANALYZING AND EVALUATING AUTOMOTIVE NOISE

Instruments used in the automotive industry to analyze and evaluate vehicle noise are outlined. Noisy components are identified, quieted, and subsequently rated. Emphasis is placed on use of proper frequency analysis instruments, noting the physics of noise and vibration. Vibration is plotted in engine order analysis, noting engine rotational speed, and a typical measuring system is shown. Passby tests are conducted, diagrammed, and described.

by A. J. Schneider
B and K Instruments, Inc., Cleveland, Ohio
Rept. No. SAE-740108; 1974; 5p
Presented at the Automotive Engineering Congress, Detroit, 25
Feb - 1 Mar 1974.
Availability: SAE

HS-014 906

A SINGLE-WHEEL TRAILER FOR TIRE NOISE RESEARCH

A single-wheel trailer has been designed and built to study the origins of tire noise and its basic characteristics. The single

test tire, nominally the 10.00/20 size usually mounted on large trucks and semitrailers, is located 12.2m (40 ft) behind the rear axle of the towing vehicle to isolate it from other noise sources. Reflective surfaces that could interfere with noise measurements are minimized by the high, single-beam construction of the trailer. The towing vehicle is modified to reduce its noise and wake in the vicinity of the test tire, which can be loaded to 22.2kN (5000 lb) by dead weights and rolled at expressway speeds. Because of its unusual configuration, the dynamic behavior of the trailer was studied prior to design to help determine several design parameters and show that the trailer would follow well. Extensive stress analyses of the trailer would follow well. Extensive stress analyses of the trailer beam and other structural elements were also required. The trailer has been built and operated, and adequately overcomes anticipated mechanical problems. A program of research into the mechanisms of tire noise generation which employs this trailer is now under way.

by I. D. Wilken; R. Hickling; H. V. Wiknich
General Motors Res. Labs., Warren, Mich.
Rept. No. SAE-740109 ; 1974 ; 12p 16refs
Presented at the Automotive Engineering Congress, Detroit, 25 Feb - 1 Mar 1974.
Availability: SAE

HS-014 907

AXLE GEAR NOISE QUALITY INSPECTION

A gear tester has been developed that can predict the relative level of axle noise in the cab of a truck. This paper documents the development in five parts: establishing the characteristics of noise generated by the axle in the cab of a small gas powered truck, developing a viable gear tester for the noise quality measurement of spiral bevel gear sets, establishing correlation between gear tester ratings and in-truck ratings of axle noise, testing a random sample of gears to determine the population's noise quality distribution, and predicting the errors associated with using the gear tester in quality control.

by J. J. Bair; W. Pickornik; R. Melkerson; T. O'Boyle
Eaton Corp., Cleveland, Ohio.
Rept. No. SAE-740110 ; 1974 ; 8p
Presented at the Automotive Engineering Congress, Detroit, 25 Feb - Mar 1974.
Availability: SAE

HS-014 908

RELATIONSHIP BETWEEN SPARK PLUGS AND ENGINE-RADIATED ELECTROMAGNETIC INTERFERENCE

The ignition system of any spark-ignited internal combustion engine-powered device is well recognized as a major source of radiated electromagnetic interference (EMI). Spark plug designs can be selected to aid in reducing ignition-related EMI. The effects of various spark plug designs such as resistor spark plugs, inductor spark plugs, and shielded spark plugs upon both EMI and ignition system performance are presented. In addition to studying the effect of spark plug design, the use of the SAE standard (J551b) and other EMI measurement techniques to determine effect of spark plug suppression designs are discussed. Generally, the addition of a resistor to the spark plug provides the most effective spark plug suppression. However, other designs may be effective as an

addition to the resistor or as a substitute where resistors cannot be practically used.

by R. R. Burgett; R. E. Massoll; D. R. Van Uum
General Motors Corp., Flint, Mich. AC Spark Plug Div.
Rept. No. SAE-740111 ; 1974 ; 19p 4refs
Presented at the Automotive Engineering Congress, Detroit, 25 Feb - 1 Mar 1974.
Availability: SAE

HS-014 909

IS THERE A BEST METHOD TO SUPPRESS RFI FROM SMALL ENGINE IGNITION?

Increased demand for reduced electromagnetic radiation from small engine operation has necessitated an evaluation of the effectiveness of various suppression methods available to the engine manufacturer or end-user. This investigation studied the effectiveness of different suppressors in spark plugs, spark plug boots, shielded connectors, and ignition leads. Suppression from resistance, inductive resistance, and shielding were evaluated. This work was undertaken on "breadboarded" ignition systems of the battery coil inductive, magneto, and capacitor discharge types. Results from these were then compared to actual spark ignited engines mounted in lawnmowers, snowmobiles, chain saws, and a motorcycle.

by J. F. Hoffman; R. W. Bensman
Champion Spark Plug Co., Toledo, Ohio
Rept. No. SAE-740112 ; 1974 ; 35p
Presented at the Automotive Engineering Congress, Detroit, 25 Feb - 1 Mar 1974.
Availability: SAE

HS-014 910

A REPORT OF SOME NEW DEVELOPMENTS IN RFI SUPPRESSION

The methods of radio frequency interference (RFI) suppression presently widely used in automobiles have operating problems when employed with capacity discharge or magneto ignition systems in "off-the-road" types of equipment. Tests have shown that several new methods have been extremely effective with these two types of ignition systems and are compatible with satisfactory engine performance. A series of tests using several suppression devices on snowmobiles, power mowers, chainsaws, and a motorcycle is described. It is concluded that there is no reliable single way of suppressing all capacity discharge or magneto ignition systems. Although the varied electrical characteristics of the ignition system do not affect RFI suppression, the construction details of the engine and the geometry of the cable routing do. It is further concluded that new inventions for the RFI problem are needed.

by N. H. Berry; P. C. Bertelson
Pyrohm, Inc., Detroit, Mich.
Rept. No. SAE-740113 ; 1974 ; 7p
Presented at the Automotive Engineering Congress, Detroit, 25 Feb - 1 Mar 1974.
Availability: SAE

HS-014 911

COMBUSTION BOMB TESTS OF LASER IGNITION

Tests of laser ignition are conducted in a combustion bomb. A range of fuels is investigated comprising isooctane, cyclohexane, n-heptane, n-hexane, clear indolene, and No. 1 diesel fuel. The ignition characteristics of laser-induced sparks are compared with sparks generated with a spark plug for different air/fuel ratios. The power density required to produce laser induced sparks is investigated. Although laser ignition appears to be impractical as an ignition device because of its low efficiency and high cost, it presents some interesting possibilities compared to the standard spark plug in that the laser spark is electrodeless and can be positioned anywhere inside the combustion chamber. Its primary use appears to be as a research tool.

by R. Hickling; W. R. Smith
General Motors Res. Labs., Warren, Mich.
Rept. No. SAE-740114 ; 1974 ; 9p 9refs
Presented at the Automotive Engineering Congress, Detroit, 25 Feb - Mar 1974.
Availability: SAE

HS-014 912

THE DEVELOPMENT OF U. K. STANDARD OCCUPANT PROTECTION ASSESSMENT TEST DUMMY

A dummy designed for England's Transport and Road Research Laboratory was tested in a series of sled tests with lap and diagonal belts with alternate diagonal belts. The sled was decelerated from 40 ft/sec with a pulse in the order of 42 g, and results tabulated. Tests of dummy segments are also described and their results shown. Coefficients of variation for the dummy were calculated and compared with Hybrid 2 dummies tested at Calspan. The development work to date has proved that it is possible to attain practical standards of humanlike performance combined with relative simplicity, robustness, and economy of manufacture. In particular, the concept of producing a more simple and robust dummy, less sensitive to minor variation in procedures and test parameters, has produced benefits in terms of repeatability of test results.

by P. Warner
Ogle (David) Ltd., Letchworth, Herts. (England)
Rept. No. SAE-740115 ; 1974 ; 22p
Presented at the Automotive Engineering Congress, Detroit, 25 Feb - 1 Mar 1974.
Availability: SAE

HS-014 913

ANTHROPOMETRIC GOLDEN SHELL MODELS AND THEIR DESCRIPTION BY STEREOMETRIC MEASUREMENTS

Fiberglass models for a crash dummy were made in a seated position. Anthropometric measurements were verified. Duplicates of these were made, having humanlike body construction, for the purpose of establishing the weights and mass distribution of the models. Stereometric measurements, yielding a quantification of body shape and size in the form of point coordinates in three dimensional space and cross-sectional profiles throughout the body, were taken. Thus, the point coordinates constitute a Quantitative record of each

master model's spatial configuration and the graphical output comprises a set of templates for physically reconstructing or verifying reconstruction of any of the models. The accuracy of stereometric measurements is comparable with the accuracy obtained by conventional methods. The procedures employed in obtaining stereometric measurements of the master models and use of these data for extraction of desired information are described in this paper.

by V. G. Radovich; R. E. Herron
National Hwy. Traf. Safety Administration, Washington, D. C.; Baylor Coll. of Medicine, Houston, Tex.
Rept. No. SAE-740116 ; 1974 ; 9p 6refs
Presented at the Automotive Engineering Congress, Detroit, 25 Feb-1 Mar 1974.
Availability: SAE

HS-014 914

SENSITIVITY STUDY OF OCCUPANT RESPONSE IN SIMULATED CRASH ENVIRONMENT

The sensitivity of response of crash victim simulation was investigated using a two-dimensional, mathematical eight-mass model. The model was exercised in the forward collision mode in a three-point restraint system using a trapezoidal forcing function. Mass and inertia parameters of the occupant simulation, its setup, and the restraint systems were evaluated individually and as groups, in terms of their effects on the occupants head and chest acceleration. The study also investigates and rates the effects of shape and time duration of the forcing function upon the response of the occupant.

by S. H. Backaitis
National Hwy. Traf. Safety Administration, Washington, D. C.
Rept. No. SAE-740117 ; 1974 ; 21p 9refs
Presented at the Automotive Engineering Congress, Detroit, 25 Feb-1 Mar 1974.
Availability: SAE

HS-014 915

USE OF SYNTHETIC LUBRICANTS IN MULTIGRADE MOTOR OILS

The use of several different synthetic lubricants in the formulation of multigrade motor oils is examined from the point of view of their physical and chemical characteristics and the commercial suitability. The influence of synthetic lubricant bases upon some of the performance characteristics of conventional additives has been considered. Engine test results using an SAE 10W/50 oil containing an ester base are compared with the performance of a similar SAE grade motor oil based upon mineral oil alone.

by L. Imparato; F. Berti; G. Mancini; G. Pusateri
SNAM Progetti, Milan (Italy); AGIP, Milan (Italy)
Rept. No. SAE-740118 ; 1974 ; 11p 22refs
Presented at the Automotive Engineering Congress, Detroit, 25 Feb-1 Mar 1974.
Availability: SAE

HS-014 916

SYNTHETIC ENGINE OILS--A NEW CONCEPT.

A new class of synthetic fluids has been developed with specific physical and chemical properties, which can be used

to formulate automotive engine lubricants with a performance range far exceeding that obtainable with conventional mineral-oil-based lubricants. Synthetic engine lubricants are described that provide improved low-temperature fluidity and cold-starting performance, better high-temperature stability and engine cleanliness, outstanding viscosity stability, reduced oil consumption, better oil pressure retention, and reduction of engine wear. The superiority of these new synthetic lubricants is documented with results of evaluations conducted in a wide range of engines and vehicles using standard and newly developed test procedures. Testing under severe rally and field conditions is also discussed.

by B. J. Miller; T. W. Rogers; D. B. Smith; W. P. Trautwein
Mobil Oil Co. Ltd., Stanford-le-Hope, Essex (England); Mobil Res. and Devel. Corp., New York; Mobil A. G., Wedel (West Germany)
Rept. No. SAE-740120 ; 1974 ; 20p 10 refs
Presented at the Automotive Engineering Congress, Detroit, 25 Feb-1 Mar 1974.
Availability: SAE

HS-014 917

HEAVY-DUTY DUAL-FUEL DIESEL ENGINES FOR SMOKE REDUCTION IN CITY BUS SERVICE

A method of smoke reduction for city buses with diesel engines is discussed. A mixed fuel of liquified petroleum gas and the standard fuel, diesel oil, was found to reduce smokiness. Bench tests, vehicle road tests, and actual service tests were carried out. Bench test evaluations were made of smokiness, hydrocarbon, nitrogen dioxide and CO emissions. Road tests evaluated exhaust smokiness, performance, fuel consumption, and running cost. Although the cost of liquified petroleum gas can be twice that of diesel oil, this increased running cost is virtually offset by the lower engine maintenance costs. The possibility of extending the use of this dual fuel to other types of bus engines is raised.

by G. Antonucci; L. Zandona
Fiat S.p.A., Turin (Italy)
Rept. No. SAE-740121 ; 1974 ; 11p
Presented at the Automotive Engineering Congress, Detroit, 25 Feb-1 Mar 1974.
Availability: SAE

HS-014 918

HIGH-SPEED, MULTIFUEL ENGINE: L9204 FMV

The ability of the L9204 FMV engine to burn a very wide range of fuels from diesel oil to premium-grade gasoline, with the efficiency of the diesel cycle and without loss of power, has been made possible by the adoption of a new combustion system. This system relies upon spark ignition for satisfactory operation when burning ignition-resisting fuels. As opposed to other multifuel engines employing straight compression ignition, it was not necessary in this engine to raise the compression ratio above the level usual in direct-injection diesel engines. As a result, it has been possible to avoid the power-loss penalty imposed by increased compression ratios. Second, maximum combustion pressures have remained much lower,

which has greatly benefited light-weight construction, one of the aims of this development.

by A. G. Urlaub; F. G. Chmela
Maschinenfabrik Augsburg-Nurnberg A. G., Augsburg (West Germany)
Rept. No. SAE-740122 ; 1974 ; 11p 6 refs
Presented at the Automotive Engineering Congress, Detroit, 25 Feb-1 Mar 1974.
Availability: SAE

HS-014 919

EMISSIONS STUDY OF A SINGLE-CYLINDER DIESEL ENGINE

Exhaust measurements of NO, soot, and hydrocarbons were made on a 2340-cu.cm. displacement, single-cylinder diesel engine operated over a range of speed, fuel-air ratio, and timing. Modifications systematically tested include chamber shape (open and divided chamber, prechamber volume ratio, and compression ratio), air swirl, thermodynamic state of the intake charge (EGR, turbocharging, water injection, and air temperature), and fuel injection parameters (orifice size, rate of injection, cam shape, pilot injection). Exhaust data suggest that the phenomena of air swirl, fuel spray, and diffusion flames are key elements in diesel combustion behavior. The sensitivity of emissions to time-dependent phenomena such as mixing rates, ignition, heat transfer, and burning rates is apparently connected to the extent to which heat release is delayed.

by R. P. Wilson, Jr.; E. B. Muir; F. A. Pellicciotti
Ultrasystems, Inc., Irvine, Calif.; White Motor Corp., Torrance, Calif.
CONTRACT EPA-68-01-0436; CAPE-20-71
Rept. No. SAE-740123 ; 1974 ; 47p 23 refs
Presented at the Automotive Engineering Congress, Detroit, 25 Feb-1 Mar 1974.
Availability: SAE

HS-014 920

APPLICATION OF ELECTRO-OPTICAL TECHNIQUES IN DIESEL ENGINE RESEARCH

Preliminary results of feasibility studies of applying electro-optical diagnostic techniques to diesel engine research are presented. A 2-cycle, 3-cyl, diesel engine was modified by installing quartz windows in the combustion chamber to provide optical access. Techniques investigated include photography, holography, laser resonance absorption spectroscopy, and laser velocimetry. Droplet formation, breakup, and combustion can be observed in the combustion chamber in three dimensions using holography. The same hologram can be used for particle sizing and flow visualization studies. Formation of certain hydrocarbons can be observed in real time with resonance absorption, using a tunable He-Ne laser. It has been established that laser velocimetry can give components of air velocity in the combustion chamber of a motored diesel engine. The techniques described are currently being developed for application to diesel engine research and to evaluation of a stratified charge spark ignition engine.

by J. D. Trolinger; H. T. Bentley; A. E. Lennert; R. E. Sowls
ARO, Inc., Tullahoma, Tenn.
CONTRACT F40600-74-C0001; MIPR-A56624-2-1303
Rept. No. SAE-740125 ; 1974 ; 12p 14 refs
Presented at the Automotive Engineering Congress, Detroit, 25 Feb-1 Mar 1974.
Availability: SAE

HS-014 921

BRAKE FLUID TEMPERATURES OBTAINED IN ALPINE VEHICLE TRIALS

The brake fluid temperatures of three passenger cars were monitored during Alpine vehicle trials in Italy and Switzerland. Comparison of the data obtained with those from similar evaluations in the United States shows that European conditions can make greater high-temperature demands on brake fluid, temperatures above 150 degrees C being frequently experienced. The high-temperature performance requirements of European brake fluids are discussed.

by I. Burgess
Burmah Oil Trading Ltd., London (England). Castrol Res. Lab.
Rept. No. SAE-740126 ; 1974 ; 12p 8refs
Presented at the Automotive Engineering Congress, Detroit, 25 Feb-1 Mar 1974.
Availability: SAE

HS-014 922

GLYCOL ETHER BRAKE FLUIDS

The primary function of a motor vehicle brake fluid is to provide a means for transmitting pressure from the brake pedal to the wheel cylinder or caliper where the pressure is transformed into the required braking effort. In order to perform this function efficiently, the brake fluid must remain in a liquid state free of gas or air bubbles so that compressibility is not a significant factor. The performance of brake fluid in braking systems in service is a matter of primary interest to brake engineers. The effect of water contamination on conventional glycol ether type brake fluids is discussed and compared with the capabilities of water intolerant fluids in conventional braking systems.

by R. G. Brown
Wagner Electric Corp., St. Louis, Mo.
Rept. No. SAE-740127 ; 1974 ; 9p 9refs
Presented at the Automotive Engineering Congress, Detroit, 25 Feb - 1 Mar 1974.
Availability: SAE

HS-014 923

PERFORMANCE CHARACTERISTICS OF SILICONE BASED BRAKE FLUIDS

Silicone based brake fluids have demonstrated performance characteristics that are improvements over current brake fluids. They do not absorb water through elastomeric brake hoses, and their boiling point and low temperature viscosity do not change in service. The tendency toward brake system corrosion and the vapor pressure of silicone brake fluids are minimal. Silicone brake fluids are compatible with brake system components and will function as an effective brake fluid even when mixed with glycol brake fluids.

by G. R. Browning
General Electric Co., Schenectady, N. Y.
Rept. No. SAE-740128 ; 1974 ; 6p 7refs
Presented at the Automotive Engineering Congress, Detroit, 25 Feb - 1 Mar 1974.
Availability: SAE

HS-014 924

ENGINEERING DESIGN BENEFITS OF SILICONE BRAKE FLUIDS

The primary goal of this search has been based on the need to identify a fluid that can be used in any vehicle on the road with no detrimental effects on any component of the braking system. This paper discussed silicone hydraulic brake fluid formulations that are capable of performing this first and most important task. Physical properties of silicone fluids that provide improved safety and performance are presented. Such fluids provide cost savings in reduced structural damage and the means for potential cost savings in new safety design capability for warning light systems, brake power boosters, smaller and lighter components, and antiskid, automatic and wheellock control devices. Silicone brake fluids offer an infinitely superior all-weather, all-climate brake fluid for reduced maintenance and replacement costs.

by D. R. Chapman
SWS Silicones, Adrian, Mich.
Rept. No. SAE-740129 ; 1974 ; 8p 9refs
Presented at the Automotive Engineering Congress, Detroit, 25 Feb - 1 Mar 1974.
Availability: SAE

HS-014 925

FILLING THE NEEDS OF THE HANDICAPPED DRIVER

If a physically handicapped person has fairly good use of his upper torso, he can usually learn to drive a vehicle safely with adaptations of normal foot control. Such adaptations do not preclude the car being driven by able bodied persons however. To be completely independent the handicapped driver must be able to transfer himself and any assist device into a car, maintain proper body position and balance behind the wheel, skillfully operate special controls required by his condition, and to transfer himself and assist device out of the car. Records show that their performance is good and that private transportation can change their status from unemployable to that of employable.

by M. D. Rhoads
Publ: Traffic Safety v74 n2 p26-7, 35-7 (Feb 1974)
1974
See also HS-013 189.
Availability: See publication

HS-014 926

AUSTRALIANS GIVE NEW TWIST TO DDC

With minor adaptations to Queensland conditions, the National Safety Council's Defensive Driving Course was the basis for the Defensive Driving Course sponsored by the Roads Safety Council in Queensland, Australia. The course was so popular that there are 20,000 graduates, and 7,500 people are trained each year. The Road Safety Council's involvement in motorcycle safety generated a similar course for motorcyclists. Continuous interest in defensive driving by graduates led to the development of the Appraisal Driving Course for those wanting to continue to improve their driving. A Defensive Driving

Awards program was established to provide awards and incentives for good driving.

by C. Imhoff

Publ: Traffic Safety v73 n11 p22-5, 36-7 (Nov 1973)
1973

Availability: See publication

HS-014 927

CAN AN AUTOMOTIVE DESIGNER FIND HAPPINESS WITH AIS?

The abbreviated injury scale (AIS), an ordinal measure of automotive occupant crash injury severity, is discussed. Multiple regression analysis is used for empirically estimating expected AIS as a function of crash parameters. It is proposed that the estimated AIS provides a standardized measurement of crash severity. Difference between the actual and standardized crash severity provides a measure of how well particular vehicle and/or road characteristics contribute to higher or lower injury severity. Additional development of the procedure is recommended.

by W. L. Carlson

Publ: HIT LAB Reports v4 n7 pl-8 (Mar 1974)
1974 ; 3refs

Availability: See publication

HS-014 928

CLASSIFYING TRAFFIC LAW SYSTEMS ACCORDING TO JURISPRUDENTIAL POLICY

Traffic law systems are classified according to jurisprudential policy, assuming typical disposition of the typical traffic offense: detecting an errant motorist, issuing a traffic ticket, perfunctorily adjudicating the case, and assessing the penalty. Traditional traffic law system classification schemes such as the laissez-faire, the flow-oriented, the safety-oriented, and the legalistic are discussed, and jurisprudential policy classification is noted. A methodology for the study, analysis, and classification of existing traffic law systems, using pertinent, quantifiable indicators is designed to encourage researchers and practitioners in traffic safety to develop new means of analyzing traffic law systems.

by V. L. Streib

Publ: Journal of Safety Research v6 n2 p52-9 (Jun 1974)
1974 ; 11refs

Availability: See publication

HS-014 929

COMBINED EFFECTS OF ALCOHOL WITH METHAPYRILENE AND CHLORDIAZEPOXIDE ON DRIVER EYE MOVEMENTS AND ERRORS

Thirty healthy male students demonstrate effects of combinations of alcohol and chlordiazepoxide or methapyrilene, or combinations of any of the 3 drugs with a placebo. Although none of the combinations produced significant increases in driving errors, driver eye movements were affected. Alcohol suppressed eye movement frequency and restricted the useful field of view. Chlordiazepoxide had a moderate antagonistic effect and methapyrilene had a strong antagonistic effect on the suppression of saccadic frequency by alcohol. Eye move-

ment parameters are seen as a sensitive measure of the synergistic effects of alcohol in combination with other drugs.

by S. R. Schroeder; J. A. Ewing; J. A. Allen

GRANT USPHS-MH-05993

Publ: Journal of Safety Research v6 n2 p89-93 (Jun 1973)
1974 ; 12refs

Sponsored by the U. S. Public Health Service and the Univ. of North Carolina Hwy. Safety Res. Center.

Availability: See publication

HS-014 930

SEAT BELT USE BY NIGHTTIME DRIVERS

A roadside survey is conducted between 7 p.m. and 3 a.m. during which seat belt use is observed and the drivers are interviewed. Only 14% of the drivers were observed to be wearing seat belts. Seat belt use by 49,082 drivers involved in vehicle accidents was also investigated. Seat belt use was 21.6%, 16.8%, and 11.8% for drivers involved in property-damage, injury, and fatal crashes, respectively. Seat belt use at night, by crash-involved drivers, is approximately 10% lower than average.

by G. A. Beitel; M. C. Sharp; W. D. Glauz

CONTRACT DOT-HS-077-1-100

Publ: Journal of Safety Research v6 n2 p72-7 (Jun 1974)
1974 ; 7refs

Subcontracted to the Midwest Res. Inst. for the City of Kansas City, Mo.

Availability: See publication

HS-014 931

SAFETY ROAD CHECKS, MOTOR CARRIERS OF PROPERTY, JANUARY THROUGH JUNE 1972

Road checks at roadside inspection points throughout the country are conducted to indicate relative mechanical condition of trucks, tractors, and trailers moving in interstate and foreign commerce. Special mechanical terms are defined. It is determined that 23.5% of units were mechanically unfit for operation and ordered out of service until essential repairs had been made. Data are reported on units inspected and out of service defects, particularly defects of service brake application systems. Tire defects are also reported. It is recommended that truck fleets channel more of inspection and maintenance effort into early discovery and correction of types of defects shown to occur most and defects resulting in high-cost accidents.

Bureau of Motor Carrier Safety, Washington, D. C.

1973 ; 14p

Availability: Corporate author

HS-014 932

WHAT YOU SHOULD KNOW ABOUT AUTOMOTIVE ELECTRICITY

Time will frequently be saved if a body and paint repair man is capable of doing minor electrical repairs and routine service on a vehicle in his shop. Many body and paint repair jobs are performed in areas of the car which contain electrical devices such as lights, horns, etc. Terminology of automotive electricity is explained so as to promote a proper understanding of the

November 29, 1974

HS-014 937

subject, and components of the automobile battery are discussed in some detail.

by J. Moriarty

Publ: Motor Service p34-6, 44, 58 (Jun 1974)

1974

Availability: See publication

HS-014 933

AUTOMOBILE INSURANCE LOSSES COLLISION COVERAGES. INITIAL RESULTS FOR 1974 MODELS

This fourth HLDI report describes variations in both the frequencies and sizes of claims for damage to 1974 model year private passenger vehicles of twelve domestic makes and six foreign makes during their first six months of availability, September 1973 through February 1974. It is based on data from collision coverages, that is, insurance covering damage to the insured vehicle itself, supplied by six insurance companies. Results are classified by deductible amount and operator age group. Extensive table analysis of loss payments, summary by make and series, vehicle series designations by make, and market class are included.

Highway Loss Data Inst., Washington, D. C.

Rept. No. HLDI-R74-1 ; 1974 ; 82p

See also HS-013 905, HS-013 934.

Availability: Corporate author

HS-014 934

ALCOHOL, TRAFFIC, AND CHEMICAL TESTING IN THE UNITED STATES: A RESUME AND SOME REMAINING PROBLEMS

A resume of chemical testing for alcohol in the United States is presented, noting relationship with traffic-law enforcement. Procedural and instrumental developments are reviewed. Factors involved in discrepancies between the results of analyses of near-simultaneous venous blood and breath specimens from the same subject are examined. It is suggested that calculation of a blood-alcohol concentration based on the result of a breath analysis be abandoned. It is recommended that when breath analysis is performed for law-enforcement purposes, the interpretation of the result be statutorily based on amount of alcohol found per unit volume of alveolar air. Serum or plasma of capillary blood is recommended as the sample when blood is analyzed

by M. F. Mason; K. M. Dubowski

Publ: Clinical Chemistry v20 n2 p126-40 (1974)

1974 ; 139refs

Availability: See publication

HS-014 935

GAS TURBINE ENGINE PRODUCTION IMPLEMENTATION STUDY, VOL. 1: EXECUTIVE SUMMARY. FINAL REPORT

Summarization and assessment of available information pertaining to the potential for implementing mass production of gas turbine engine-powered automobiles is presented. Main topic covered is the schedule requirement for that implementation. Emphasis is directed toward identifying critical or limiting factors affecting timely introduction of gas turbine engine

concepts on a mass production basis. A description of basic automotive product development phases, engine manufacturing processes, and gas turbine engine current technology status are included to clarify and augment the discussions, and to permit necessary understanding of the developed implementation schedules. It is predicted that an 8-10 year period estimates the elapsed time until 300,000 gas turbine engines are mass produced annually.

by D. E. Lapedes; L. Forrest; F. G. Ghahremani; O. Hamberg; W. U. Roessler; W. M. Smalley; M. Hinton; T. Iura; J. Meltzer

Aerospace Corp., El Segundo, Calif.

CONTRACT EPA-68-01-0417

Rept. No. DOT-TSC-OST-73-26-Vol-1; ATR-73(7323)-1, Vol-1; PB-225 465 ; 1973 ; 51p

Sponsored by the Dept. of Transp., Office of Systems Devel. and Technology, Washington, D. C. Report for Jan 1973 - Jul 1973. Vol. 1 of 2. See also HS-014 936

Availability: NTIS

HS-014 936

GAS TURBINE ENGINE PRODUCTION IMPLEMENTATION STUDY, VOL. 2: TECHNICAL DISCUSSION. FINAL REPORT

based on data acquired during the period February 28 to April 30, 1973, a period of 8 to 10 years is a best estimate of the elapsed time until 300,000 gas turbine engines are mass produced annually. The estimate is based on a postulated overall product development schedule of slightly more than 11 years. Prior to major commitment of capital resources necessary for adherence to this schedule, automobile manufacturers must resolve three major issues: improvements in engine fuel economy and exhaust emissions; development of new mass production fabrication processes directed at reducing engine unit cost; and statistical evidence of engine durability in fleet test care. A description of basic automotive product development phases, engine manufacturing processes, and gas turbine engine current technology status are included to clarify and augment the discussions, and to permit the necessary understanding of the developed implementation schedules.

by D. E. Lapedes; L. Forrest; F. G. Ghahremani; O. Hamberg; W. U. Roessler; W. M. Smalley; M. Hinton; T. Iura; J. Meltzer

Aerospace Corp., El Segundo, Calif.

CONTRACT EPA-68-01-0417

Rept. No. DOT-TSC-OST-73-26-Vol-2; ATR-73(7323)-1, Vol-2; PB-225 466 ; 1973 ; 152p refs

Sponsored by the Dept. of Transp., Office of Systems Devel. and Technology, Washington, D. C. Report for Jan 1973 - Jul 1973. Vol. 2 of 2. See also HS-014 935

Availability: NTIS

HS-014 937

DEVELOPMENT OF A COMPUTER SIMULATION TO EVALUATE THE EFFECTIVENESS OF VEHICLE REAR MARKING AND SIGNALING SYSTEMS. INTERIM REPORT

An analysis of individual car-following behavior was developed using a Monte Carlo computer simulation model. The period during which the headway distance between the vehicles was being reduced was divided into a detection phase, a decision phase, and an action phase. The relationship of

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these phases to distance and relative velocity between moving vehicles was studied both analytically and empirically. Data sources included: velocity and headway measures from an instrumented highway, qualitative and quantitative glance patterns of drivers recorded by an eye camera, and video tape recordings of vehicles closing on slow moving vehicles. These data were combined with the analytic results to indicate the infrequency of "critical events" in actual highway driving. Simulation models have proven to be valuable tools for the study of complex systems. Their usefulness is limited by the degree to which the model operates like the system being studied.

by W. L. Carlson; R. G. Mortimer
Michigan Univ., Ann Arbor. Hwy. Safety Res. Inst.
CONTRACT UM-7293-C128
Rept. No. UM-HSRI-HF-74-20; PB-231 111 ; 1974 ; 59p 12refs
Sponsored by the Motor Vehicle Mfrs. Assoc., Detroit, Mich.
Availability: NTIS

HS-014 938

FUNDAMENTALS AND ABATEMENT OF HIGHWAY TRAFFIC NOISE. FINAL REPORT

A five day course on the fundamentals and abatement of highway traffic noise is presented in this textbook. The areas covered are: fundamentals of sound, traffic noise sources, environmental noise measurements, traffic noise prediction, and noise abatement. Noise emission levels of automobiles and the principal components of truck noise are discussed. Noise abatement treatments available for noise control both on the highway and off the highway are presented. An evaluation of the noise reduction that can be achieved with acoustic barriers alongside the road reveals that the individual types of barriers must be adapted to the specific area in which they are to be used.

by G. S. Anderson; L. N. Miller; J. R. Shadley
Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
CONTRACT DOT-FH-11-7976
Rept. No. PB-222 703 ; 1973 ; 202p refs
Prepared for Federal Hwy. Administration.
Availability: NTIS

HS-014 939

INJURY PATTERNS IN MOTORCYCLE COLLISIONS

The purpose of the present report is to describe motorcycle injuries in Sacramento County, California during 1970 and to examine certain factors associated with their occurrence. This report focuses on specific findings concerning the nature and severity of trauma associated with collisions. The number of injuries was confirmed through police reports, hospital admission, and emergency room medical records. Slightly more than four percent of all registered motorcycles were involved in an injury-producing collision in a single year. The peak incidence of injury rate was for male drivers 18 years of age. Almost 45 percent of injured motorcyclists suffered a serious injury with injuries to the musculoskeletal system in the form of fractures being the most common. It is hoped that by alerting physicians to the multiplicity of injuries and their patterns, death and per-

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manent disabilities from motorcycle collisions might be reduced.

by W. F. Drysdale; J. F. Kraus; C. E. Franti; R. S. Riggins
California Univ., Davis. School of Medicine
1974 ; 44p p 22 refs
Sponsored by the Insurance Inst. for Hwy. Safety,
Washington, D. C. and the Dept. of Community Health,
School of Medicine, U. C., Davis.
Availability: Corporate author

HS-014 940

THE FATAL CRASH REDUCTION PROGRAM: A REEVALUATION

The "Fatal Crash Reduction Program" was developed by the National Highway Traffic Safety Administration to demonstrate and evaluate the effectiveness of increased police patrolling and traffic law enforcement in reducing highway fatalities. Claims were made that the Fatal Crash Reduction Program in Michigan resulted in 42 fewer fatal crashes and 59 fewer fatalities than expected, and a nationwide, 10 million dollar intensified enforcement program--the "Fatal Accident Reduction-Enforcement Program" (FARE) -- WAS SUBSEQUENTLY LAUNCHED. However, a reevaluation of the was subsequently launched. Reduction Program presented in this report indicates that it was not effective in reducing highway fatalities, and that the original evaluation was designed and analyzed by the National Highway Traffic Safety Administration in such a way that incorrect results were obtained.

by A. F. Williams; L. S. Robertson
Insurance Inst. for Highway Safety, Washington, D. C.
1974 ; 24p 19refs
Availability: Corporate author

HS-014 941

USE OF SAFETY BELTS (BRUG AF SIKKERHEDSSELER)

A sociological study was conducted of the use of safety belts in private cars, focusing around the personal, social, and physiological characteristics of the user and non-user, with a special view to promoting better educational campaigns for the future. A random selection of 100-120 owners of private cars equipped with safety belts at least in the front seat area were interviewed.

by L. Ostergaard
Forenede Danske Motorejere, Copenhagen (Denmark)
1973 ; 27p
Sponsored by the Road Safety Res. Council, Copenhagen K,
Denmark Text in Danish.
Availability: Road Safety Research Council, DK-Lyngby, 1,
Anken Engelundsvej Bldg. 117, Copenhagen K, Denmark

HS-014 942

CRASH PROTECTION FOR BABIES

The dynamic performance of devices that are intended to protect baby occupants of crashing automobiles is examined from an engineering point of view. Dynamic collision simulations were carried out with "baby" dummies restrained by each of three "baby" restraints that were readily available in Sydney.

November 29, 1974

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Further simulations were carried out on some experimental restraints. Strengths and weaknesses of the various restraints are explored and conclusions reached about the crash protection available to babies in New South Wales indicate that the restraint of the prone baby requires a container stronger, stiffer, and better padded than those available.

by B. A. Vazey; D. C. Herbert; V. Leitis
New South Wales. Dept of Motor Transport, Sidney
(Australia)
1974 ; 27p 3refs
Availability: Traffic Accident Research Unit, Dept of Motor
Transport, New South Wales, Sidney, Australia

HS-014 943

SASH DISCOMFORT IN SEAT BELTS

Three point restraint systems are mandatory in Australian cars. In some cars the location of the sash anchorage point for lap/sash belts in front seating positions permits the sash strap to either fall off the shoulder of many wearers or to cause discomfort by pressing on their necks. This paper describes a newly developed sash guide that can easily be fitted in practically any car that displays either of these problems, and effectively corrects the belt layout to one that is comfortable and convenient, without degrading the safety of the belt. The comfort features of the sash guide are mandatory provisions of new Australian Design Rules effective on January 1, 1975. Existing cars may be corrected in the meantime by fitting them with this sash guide.

by D. C. Herbert; V. Leitis
New South Wales. Dept. of Motor Transport, Sidney
(Australia)
1973 ; 33p 1ref
Availability: Traffic Accident Research Unit, Dept. of Motor
Transport, New South Wales, Sidney, Australia

HS-014 944

ROAD ROUGHNESS TECHNOLOGY, STATE OF THE ART. FINAL REPORT

This paper gives an overview of road roughness technology, lists the most prominent equipment used in longitudinal profile evaluations, and discusses uses of the measurements. Several types of roughness measurement equipment are operational for the purpose of measuring riding quality; whereas, development of equipment, data reduction procedures, and meaningful acceptance criteria of roughness for highway safety, for predicting pavement loading from heavy vehicles, and for determining pavement life expectancy have not reached the point where the equipment and procedures are operational for large scale road inventory purposes.

by G. G. Balmer
Federal Hwy. Administration, Washington, D. C.
Rept. No. FHWA-RD-73-54 ; 1973 ; 39p 80refs
Availability: NTIS

HS-014 945

FURTHER EXPERIMENTS IN DRIVER INFORMATION PROCESSING

142 men and women have driven a 110-mile section of Ohio rural roads with speed and lateral acceleration recorded in curves. Observed differences between men and women are no longer seen when groups are matched for number of miles per year driven. Driving response to advisory speed signs produced a curious inversion in the 35 and 40 mph range. Data are reported for night driving, driving with no speedometer, and with low tire pressure. Insignificant differences were obtained with radial versus bias ply tires and with motorcycle versus automobile. It seems apparent from the data presented that the driver response to signs along the roadway is conditioned by what else he sees of the roadway, by his estimate of his vehicle's roadworthiness and by many factors which relate him as an experienced driver.

by M. L. Ritchie; J. M. Howard; W. D. Myers; S. Nataraj
Publ: Proceedings of the 16th Annual Meeting of the Human
Factors Society p34-9 (Oct 1972)
1972 ; 5refs
Availability: Human Factors Society, P.O. Box 1369, Santa
Monica, Calif. 90406

HS-014 946

OBSERVATIONS ON A SIMULATED DRIVING TASK AND ITS EFFECTS ON RESPONSE TIME TO PERIPHERAL VISUAL SIGNALS FOR LEFT AND RIGHT HANDED SUBJECTS

An experiment was conducted under simulated driving conditions using a 'wrap around' parabolic screen and an animated film projection system to assess the overall performance task of monitoring peripheral visual signals with subject attention held in the central field. One of the important findings was the significant effect of side on subjective Response Time (RT) to these signals. Some observations are made regarding the effect of left and right handed subjects on these RT's, and the inter-relationships among performance parameters. Concentration and performance were correlated, an increase in one resulting in a corresponding increase in the other. Subjects who had better performance and higher concentration levels at the central driving task seemed to be better co-ordinated and also had faster response times than others.

by D. S. Kochhar; T. M. Fraser
GRANT NRC-079-6272-22
Publ: Proceedings of the 16th Annual Meeting of the Human
Factors Society p40-3 (Oct 1972)
1972 ; 5refs
Availability: Human Factors Society, P.O. Box 1369, Santa
Monica, Calif. 90406

HS-014 947

AUTOMOBILE ESCAPE WORTHINESS--AN APPROACH TO A PREDICTIVE MODEL

A multiple linear regression model is used to predict escape from automobiles as a function of some physical parameters of the automobile. The model was derived from empirical data obtained in a series of experiments utilizing five different automobiles, sub-compact to full size sedan. Escape trials are conducted using the model automobile. A mean absolute

deviation of 12.3% between actual and predicted escape times was achieved with a maximum of 29% absolute deviation. In fourteen of sixteen comparisons of actual data with predicted escape times, the predicted escape times were less than the actual escape times. This empirically derived model is found to have a capability for reasonably predicting the relative escape worthiness of automobiles whose design parameters fall within those of the five original automobiles tested.

by R. F. Krenek; J. L. Purswell
CONTRACT DOT-FH-11-7512
Publ: Proceedings of the 16th Annual Meeting of the Human Factors Society p46-57 (Oct 1972)
1972 ; 2 refs
Availability: Human Factors Society, P.O. Box 1369, Santa Monica, Calif. 90406

HS-014 948

LATERAL VEHICLE PLACEMENT AND STEERING WHEEL REVERSALS ON A SIMULATED BRIDGE OF VARIABLE WIDTH

Steering reversals and lateral placement are studied using a Greenshield's Drivometer and a Super 8 mm time lapse movie camera observing a simulated highway bridge. Eight male and two female subjects were tested for eight shoulder width conditions during 30 runs on a 50 ft. bridge. Trends reported include minor and major steering reversals for shoulder widths greater than 4ft. The distance of vehicle from centerline of roadway also reached a maximum for a 4ft. to 6ft. shoulder width. Subjects tended to drive closer to centerline for shoulder widths less than or greater than approximately 4 to 6ft. Results indicate the need for a minimum shoulder width of 4ft. if traffic operations are not to be influenced.

by L. E. King; R. W. Plummer
Publ: Proceedings of the 16th Annual Meeting of the Human Factors Society p58-63 (Oct 1972)
1972 ; 8 refs
Based on interim report submitted to the W. Va. Dept. of Hwys., "Bridge Shoulder Width Study," Res. Proj. 36.
Availability: Human Factors Society, P.O. Box 1369, Santa Monica, Calif. 90406

HS-014 949

FIELD INVESTIGATION OF DRIVER UNDERSTANDING OF LEFT TURN SIGNAL INDICATION SEQUENCES

In the case where a left turning movement at an intersection is to be terminated while the straight-through movement continues, the Manual on Uniform Traffic Control Devices requires that a separate signal face, consisting of circular red and yellow lenses and a green turn arrow lens, be provided to control the turning movement. In many instances the physical limitation of an intersection or for reasons of economy it is difficult to comply with this standard. Present practice at such locations is to mount a fourth lens, displaying a turn arrow either on the through face or adjacent to it. Installations such as this result in a wide variety of clearance interval indications. This research project was designed to develop a standard for this situation. A literature review and mailed questionnaire were employed to determine present practices. A controlled laboratory study, utilizing both color movies and color slides, investigated nineteen signal indications for their effectiveness. Four of the indications were further tested

under actual field conditions. Based on results of this study, single indication was recommended.

by L. E. King; R.W. Plummer
Publ: Proceedings of the 16th Annual Meeting of the Human Factors Society p64-9 (Oct 1972)
1972 ; 13 refs
Based on interim report submitted to the W. Va. Dept. of Hwys., "Meaning and Application of Color and Arrow Indications for Traffic Signals," Res. Proj. 31.
Availability: Human Factors Society, P.O. Box 1369, Santa Monica, Calif. 90406

HS-014 950

EVALUATION OF VISUAL FIELD REQUIREMENTS OF VEHICLES IN FREEWAY MERGING SITUATIONS

Evaluation of visual field requirements of vehicles in freeway merging situations is made, to provide an assessment technique to the vehicle designer to evaluate visual field requirements of the vehicles for various freeway merging situations. A computer model of the merging situation is developed on the basis of the driver behavioral and traffic flow data collected on different freeway merging situations which incorporates: empirical vehicle performance data synchronized with the merging road geometry; driver eye movement data synchronized with the merging road geometry and measurement of the characteristics of traffic flows in both the merging lanes. Empirical methods and the computer model developed in this research are presented. It is concluded that the portions of visual field that provide important information in avoiding side collisions can be determined and visual field requirements of vehicles for different merging road geometries can be established.

by V. D. Bhise; T. H. Rockwell
Publ: Proceedings of the 16th Annual Meeting of the Human Factors Society p70-9 (Oct 1972)
1972 ; 10 refs
Sponsored by the Society of Automotive Engineers, Inc.
Availability: Human Factors Society P. O. Box 1369, Santa Monica, Calif. 90406

HS-014 951

THE EFFECTS OF BREWED BEVERAGES ON PSYCHOMOTOR PERFORMANCE

The effects of brewed beverages on psychomotor performance are investigated in 50 male college students, aged 18 to 25 who have consumed specifically allotted amounts of beer. Testing is conducted on the One-Hole test and times recorded for motions of reach, grasp, move, and position. Analysis of variance of results showed no effects on the mean reach, grasp, move, or position times, nor any change in missed grasp, or missed position due to any levels of the beer intake tested nor intake per unit of body weight. A correlation regression analysis showed significant relationship between beer consumed per one-hundred pounds of body weight versus mean reach, move, grasp, or position time.

by C. M. Root D. R. Harris
Publ: Proceedings of the 16th Annual Meeting of the Human Factors Society p81-5 (Oct 1972)
1972 ; 11 refs
Availability: Human Factors Society P.O. Box 1369, Santa Monica, Calif. 90406

HS-014 952

EYE FIXATIONS OF DRIVERS AS AFFECTED BY HIGHWAY AND TRAFFIC CHARACTERISTICS AND MODERATE DOSES OF ALCOHOL

Eye fixations are measured of two experienced drivers who drove an automobile on a four lane parkway and two lane road at 35 mph, and over expressway at 60 mph to determine the effects of the road type, car following, road geometry and blood alcohol concentrations up to 0.10%. The mean duration of eye fixations increased at 0.10% BAC, the distribution of the percent of eye fixation time and frequency in azimuth was highest in a 10 deg cone ahead of the driver in straight road sections, but moved to the right or left on right and left curves, respectively. Car following constrained the azimuth distribution of fixations. There was a non-significant indication that preview distances are reduced by alcohol. Findings show that driver's visual information acquisition is impaired by alcohol in a manner that can help explain single vehicle crashes.

by R. G. Mortimer; C. J. Jorgeson

Publ: Proceedings of the 16th Annual Meeting of the Human Factors Society p86-92 (Oct 1972)

1972 ; 9refs

Availability: Human Factors Society P.O. Box 1369, Santa Monica, Calif. 90406

HS-014 953

RICHLAND COUNTY ALCOHOL SAFETY ACTION PROJECT. AN EFFORT TO REDUCE ALCOHOL RELATED RELATED TRAFFIC ACCIDENTS

An Alcohol Safety Action Project (ASAP) funded by the National Highway Traffic Safety Administration (NHTSA) in Columbia, South Carolina, is described. Levels of effectiveness include increased enforcement activities and long term programs aiming at identifying and rehabilitating alcoholics and problem drinkers who drive. Countermeasures to curb the drinking driver are cited for near and long term. Report of rehabilitation for the drinking driver is included, noting general lack of acceptance of rehabilitation programs and better success of court remanded treatment. The effects of community responsibility and local legislation on the drinking-driving problem are noted. Evaluation of the Richland County ASAP is accomplished through a computerized management information system, a control community, and roadside survey.

by D. G. Milliman; J. D. Williams

Publ: Proceedings of the 16th Annual Meeting of the Human Factors Society p93-5 (Oct 1972)

1972

Availability: Human Factors Society P.O. Box 1369, Santa Monica, Calif. 90406

HS-014 954

A STATISTICAL INVESTIGATION INTO THE EFFECTIVENESS OF SEAT BELTS IN MOTOR VEHICLE ACCIDENTS

Statistical conclusions are sought on the effectiveness of seat belt wearing in reducing the number of fatal and non-fatal injuries suffered in road accidents in Victoria, Australia. Problems of such a statistical analysis are cited. Results are reported in terms suitable for research workers with an un-

derstanding of mathematical statistics. Police Road Accidents Statistics Sheets for 1970, before seat belt legislation became effective, were analyzed to determine whether seat belt usage resulted in fewer accidents; it was found that seat belt usage reduced driver fatalities and serious injuries. Investigation was conducted into seat belt wearing since legislation took effect, and casualties and injuries decreased proportionately. Problems associated with this research are discussed. Investigation establishes efficacy of seat belt use.

by V. H. Arnold

Commonwealth Bureau of Census and Statistics, Melbourne, Vic. (Australia), Victorian Office

1973 ; 22p 6refs

Availability: Deputy Commonwealth Statistician, Victoria, Commonwealth Banks Bldg., Cnr. Elizabeth and Flinders St., Melbourne, Australia

HS-014 955

LEGAL ASPECTS OF DRIVER EDUCATION WORKSHOP. DRIVER EDUCATION AND LIABILITY

The role of the court in evaluating driver performance is discussed, noting the legal aspects of driver education programs. Historic survey of driving practices and the eventual enactment of the first U.S. speed statute in Connecticut in 1901, followed by similar legislation in other states, is reported, necessitating court enforcement. Teacher-pupil driver education practices, occupant injuries, and liability are presented. Negligent conduct is noted and defined. Common law governmental immunity defends school districts from liability for pupil injury, and the injustice of this common law is recognized. Protective responsibilities of the school administrator are listed. It is concluded that proper instruction and careful supervision of pupils, and well-maintained equipment result in safe driver education programs and the avoidance of litigation.

by D. Schmidt

Nebraska State Dept. of Education, Lincoln

1973 ; 23p

Availability: Corporate author

HS-014 956

A COMPREHENSIVE DRIVER AND TRAFFIC SAFETY EDUCATION K-12 MULTI-MEDIA PROGRAM

Study units for a comprehensive traffic safety program in the Kokomo-Center Township Schools of Kokomo, Indiana, were developed for grades K-12. Based on the need to start traffic and pedestrian safety at the earliest age possible, guides were written for the multi-media units which include scripts and suggested related activities and objectives. Programs deal primarily with pedestrian, bicycle, patrol, and bus safety while secondary programs are concerned with dangerous intersections, the new international signs, the Indiana State Drivers' Manual, and local traffic patterns.

Kokomo-Center Township Consolidated School Corp., Ind.

1973 ; 487p refs

Sponsored by the Indiana State Dept. of Traf. Safety and Vehicle Inspection.

Availability: Corporate author

HS-014 957

HSL 74-13

HS-014 957

BREATHALYZER OPERATOR'S MANUAL

A manual is presented for law enforcement officers in Arizona enrolled in a Breathalyzer Operator's training course. It aims to foster an understanding of the requirements of the Implied Consent Law; outline the requirements and qualifications of the breath test operator; describe the nature of alcohol, its absorption and fate in the body; provide an understanding of the Breathalyzer method of measuring blood alcohol levels; and prepare the operator for court.

by L. C. Haag, comp.
Phoenix Coll., Ariz. Law Enforcement Dept.
1973 ; 34p
Availability: Reference copy only

HS-014 958

DEFENSIVE DRIVING COURSE. STUDENT WORKBOOK AND DEFENSIVE DRIVER'S MANUAL. 6TH ED.

A defensive driving workbook and manual contains three sections on safe driving, one paralleling classroom material, a second providing an outline suitable for note-taking, and a third consisting of important driving tips. Concepts covered include: preventability determination; collision avoidance from ahead, behind, with an oncoming vehicle, and at intersections; passing and being passed; the mystery crash; vehicle-pedestrian, vehicle-bicycle, and vehicle-railroad crashes; safety belts; car theft; litter; driving emergencies; winter driving; trip tips; emergency equipment; car trouble; accident information; automobile safety features.

National Safety Council, Chicago, Ill. Driver Improvement Program
1971 ; 58p
Availability: Corporate author

HS-014 959

DEFENSIVE DRIVING COURSE. MOTORCYCLE SUPPLEMENT. STUDENT WORKBOOK AND DEFENSIVE DRIVER'S MANUAL. 1ST ED.

A motorcycle supplement to a defensive driving course is presented for beginners and veterans, to be read in conjunction with classroom presentation. The exercises are designed to help apply general principles to specific situations. A test is included which is a composite test of state motor vehicle licensing tests for an operator's license. Topics covered include: learning how to ride; protective clothing; the perfect motorcycle trip; carrying passengers and parcels; lending motorcycles; parking and preventing theft; student outlines.

National Safety Council, Chicago, Ill. Driver Improvement Program
1972 ; 48p
Availability: Corporate author

HS-014 960

MULTNOMAH COUNTY TRAFFIC RECORDS

One hundred twenty high accident locations in Multnomah County, Oregon, are arrayed by total accident frequency and by hazard index, as well as by accident rate. A critical accident rate analysis method was developed during the study to eliminate locations which might have an exceptionally high accident rate simply due to chance. When critical accident locations are identified and arrayed in their priority of need, they are analyzed for possible solutions to reduce accident rates, based on an accident collision summary, accident statistics, and an on-site review.

Futrell, Inc., Vancouver, Wash.
1972 ; 78p
Engineering Study prepared in cooperation with the Oregon Traf. Safety Commission and the National Hwy. Traf. Safety Administration.
Availability: Multnomah County, 1021 S.W. 4th Ave., Portland, Oreg. 97204

HS-014 961

TRAFFIC NOISE LEVEL PREDICTOR COMPUTER PROGRAM

An update of the original State of Michigan computer program of the NCHRP Report 117 noise prediction model is presented. Input parameter definitions, flow charts, a listing, and example problems of noise levels from highway sources are included.

by G. H. Grove
Michigan Dept. of State Highways, Lansing
Rept. No. R-890 ; 1973 ; 35p 4refs
Availability: Corporate author

HS-014 962

TRAFFIC RECORDS AND NECESSARY SYSTEMS FROM EARLIER PROJECTS. FINAL REPORT [ON PROJECT TRANSFER]

The results of 19 months of achievement in transferring a computerized traffic records system (Traffic Accident and Citation Evaluation System) from the City of Redondo Beach, California, to the City of Stanton by way of Project TRANSFER (Traffic Records and Necessary Systems From Earlier pRojects) are presented. Methodology, problems, and solutions are described. A guide is included with a simple formula for determining the practicability of computer system transfer. The computerized system provides 11 reports which reflect traffic collision and citation data and were selected to meet management reporting needs of a small but heavily travelled city. System data processing is accomplished on a RCA Spectra 70/45 tape/disc operating system, using COBOL programming language.

Applied Technology, Costa Mesa, Calif.
Rept. No. APD-TECH-73-6381-1 ; 1973 ; 166p
Sponsored by the City of Stanton, Calif., the California Office of Traf. Safety, and the National Hwy. Traf. Safety Administration.
Availability: TRANSFER Project Director, Stanton Police Dept., Stanton, Calif.

HS-014 963

TRAFFIC RECORDS AND NECESSARY SYSTEMS FROM EARLIER PROJECTS. SYSTEMS AND PROGRAMMING DOCUMENTATION

Systems and program documentation for Project TRANSFER are presented, consisting of the detailed procedures for initiating and coding the various input documents, keypunch instructions, procedures for preparing data for submittal for processing and for data processing, as well as exhibits of all reports produced by the system.

Applied Technology, Costa Mesa, Calif.
Rept. No. APD-TECH-73-6381-2 ; 1973 ; 160p
Sponsored by the City of Stanton, Calif., the California Office of Traf. Safety, and the National Hwy. Traf. Safety Administration.
Availability: TRANSFER Project Director, Stanton Police Dept., Stanton, Calif.

HS-014 964

FUTURE SAFETY STANDARDS FOR JAPAN. FUTURE SAFETY STANDARDS AND THE ESV PROGRAM, SECT. 5, PT. 3

Japanese safety standards are discussed in terms of experimental safety vehicle (ESV) development. Motor vehicle safety standards are reviewed along with projected measures to avoid accidents, to reduce casualties, and to prevent fires. The ESV program is shown to contribute to raising the level of automotive technology. Specific safety standards for the future and their current status are tabulated.

by H. Kageyama
Japan Ministry of Transport, Tokyo
Publ: HS-013 939, International Technical Conference on Experimental Safety Vehicles, (4th), Kyoto, Japan, 1973 p623-33
1973
Availability: IN HS-013 939

HS-014 965

EFFICIENCY OF THE 3-POINT BELT IN REAL ACCIDENTS. FUTURE SAFETY STANDARDS AND THE ESV PROGRAM, SECT. 5, PT. 2

Some 160 cases of occupants wearing three-point belts were compared to 782 cases of occupants not wearing safety belts in equivalently violent impacts. The distribution of collisions is shown according to how the impacted zone of the vehicle is distributed or localized, symmetrical or asymmetrical. Specific cases are described. Results show that: the three-point belts are efficient in frontal collisions, roll-overs, and some side collisions; there was no case in which the belt was harmful; the first fatal accident without belt occurs within the range of 16-25 km/h, but it is necessary to reach a range three times higher with a belt; the probability of being seriously injured or killed is six times lower with the belt in 96% of all frontal collisions; belt efficiency is at its lowest in side collisions.

by C. Tarriere
Renault-Peugeot Assoc., La Garenne-Colombes (France)
Publ: HS-013 939, International Technical Conference on Experimental Safety Vehicles (4th), Kyoto, Japan, 1973 p607-19
1973
Availability: IN HS-013 939

HS-014 966

FIELD STUDIES OF TRAFFIC ACCIDENTS IN EUROPE. FUTURE SAFETY STANDARDS AND THE ESV PROGRAM, SECT. 5, PT. 2

European and North American field studies of traffic accidents are compared in an examination of experimental safety vehicle programs. Some data are discussed on the frequencies and severities of accidents of different configurations in order to optimize and refine appropriate specifications for ESV development. General conclusions are drawn regarding pedestrian and motorcyclist collisions, traffic environment differences, frontal, side and rear impacts. It is shown that accident investigation must be an integral part of any ESV program.

by G. M. Mackay
Birmingham Univ. (England)
Publ: HS-013 939, International Technical Conference on Experimental Safety
1973 ; 7refs
Availability: In HS-013 939

HS-014 967

ENERGY MANAGEMENT SYSTEM. THE JAPANESE TECHNICAL PRESENTATION, SEC. 2, PT. 1

Body structure, test results, and the feasibility of meeting specifications are given for a second series of prototypes of a Japanese experimental safety vehicle. Details of energy absorbing front, rear, and side structures are shown, as well as results of front, rear and side impact tests. The occupant protection system, consisting of an air bag and passive seat belt, is described. It is concluded that specifications regarding some injury criteria and the vehicle weight have not been met. The dummy's injury criteria would be attainable by improving the restraint system, but vehicle weight reduction would be difficult, considering the large weight excess.

by A. Wada
Toyota Motor CO. Ltd., Kariya (Japan)
Publ: HS-013 939, International Technical Conference on Experimental Safety Vehicles (4th), Kyoto, Japan, 1973 p43-9
1973
Availability: In HS-013 939

HS-014 968

DEVELOPMENT OF THE NISSAN ESV. THE JAPANESE TECHNICAL PRESENTATION, SECT. 2, PT. 1

Development of the Nissan experimental safety vehicle, a four-door, four-passenger family sedan, is described with emphasis on general safety in current traffic conditions. Handling performance and accident avoidance characteristics are emphasized. The small car is designed to provide safety in an 80 km/h frontal collision with a fixed barrier, a 65 km/h rear-end collision against a 1800kg moving barrier. and a 50 km/h

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side collision with a car of the same weight. Efforts related to pedestrian safety are also discussed.

by N. Marumo; T. Maeda
Nissan Motor Co. Ltd., Yokohama (Japan)
Publ: HS-013 939, International Technical Conference on
Experimental Safety Vehicles (4th), Kyoto, Japan, 1970 p55-68
1973
Availability: In HS-013 939

HS-014 969

TIRES AND BRAKES. THE JAPANESE TECHNICAL PRESENTATION, SECT. 2, PT. 1

The performance and characteristics of tires and brakes on Japanese experimental safety vehicles are discussed. Some emphasis is placed on acceleration and cornering tests of run-flat tires, which are seen as a safety system for the vehicle itself. The tire must be improved so that deflated its characteristics approach those of tires inflated to the specified pressure. The anti-skid brake system to be installed on the Honda ESV is also described in terms of friction coefficients and stopping distances on dry and wet asphalt, rough ice using snow tires, and smooth ice using spike and snow tires. The system is shown to have a marked effect on handling and directional stability.

by A. Irimajiri
Honda R and D Co. Ltd., Toyko (Japan)
Publ: HS-013 939, International Technical Conference on
Experimental Safety Vehicles (4th), Kyoto, Japan, 1973 p77-80
1973
Availability: In HS-013 939

HS-014 970

PROGRESS OF THE ESV DEVELOPMENT AT DAIMLER-BENZ. THE FEDERAL REPUBLIC OF GERMANY TECHNICAL PRESENTATION. SECT. 2, PT. 2

The status and progress of the Daimler-Benz experimental safety vehicle (ESV) program since 1972 is discussed. It is suggested that the full consequences of the ESV program are not now recognizable since it has led to many new questions regarding technical principles as well as accident occurrence in road traffic. Areas of accident and injury research are outlined. Problems associated with rulemaking, the definition and evaluation of vehicle handling properties, are considered, and analytical methods are suggested as a possible means for developing handling features.

by H. Scherenberg
Daimler-Benz A. G., Stuttgart (West Germany)
Publ: HS-013 939, Report on the 4th International Technical
Conference on Experimental Safety Vehicles, Kyoto, Japan,
1973 p83-94
1973
Availability: Bound in HS-013 939

HS-014 971

PROGRESS REPORT ON OPEL'S SAFETY VEHICLE ACTIVITIES. THE FEDERAL REPUBLIC OF

HSL 74-

GERMANY TECHNICAL PRESENTATION. SECT. 2, PT. 2

Phase One and Phase Two of Opel experimental safety vehicle (ESV) activities are reviewed briefly, and the Phase Three program (Opel Safety Vehicle) is examined in detail in terms of component development, basic tests, and prototypes. Major efforts are concentrated on vehicle structures, seat development, steering spindles, bumper development, rear view and lighting systems. Accident avoidance characteristics are described along with a benefit-cost study. Work with foam-filled structural elements is noted.

by B. Felzer
Opel (Adam) A. G., Russelsheim Am Main (West Germany)
Publ: HS-013 939, Report on the 4th International Technical
Conference on Experimental Safety Vehicles, Kyoto, Japan,
1973 p95-101
1973
Availability: Bound in HS-013 939

HS-014 972

EXAMPLES OF THE DEVELOPMENT OF ESV SUBSYSTEMS--PORSCHE KG. THE FEDERAL REPUBLIC OF GERMANY TECHNICAL PRESENTATION. SECT. 2, PT. 2

Specifications and characteristics of the Porsche KG rear suspension with elastic wheel mounting are presented. Test results are described along with mathematical mathematical calculations of energy management of experimental crash beams of the damping forces. The influence of the connecting coefficient on the damping forces for centered and eccentric shocks is also shown. It is noted that the excessive damping force which is applied to one shock absorber by an oblique impact can be reduced already at a comparatively low degree of coupling.

by H.-H. Braess
Porsche (H.C.F.) K. G., Stuttgart (West Germany)
Publ: HS-013 939, International Technical Conference on
Experimental Safety Vehicles, Kyoto, Japan, 1973 p103-8
1973
Availability: Bound in HS-013 939

HS-014 973

THE VOLKSWAGEN EXPERIMENTAL SAFETY VEHICLE. THE FEDERAL REPUBLIC OF GERMANY TECHNICAL PRESENTATION. SECT. 2, PT. 2

The Volkswagen Experimental Safety Vehicle (ESVW) is described. Characteristics, specifications, and test results are given for: the hydraulic brake system, anti-skid system, service, parking, and emergency brakes, tires and wheels, axle and steering, yaw response, handling (lateral acceleration, crosswind sensitivity, directional stability, etc.), windshield wipers and washers, headlight washing system, lighting and control system, crashworthiness, occupant protection, restraint system and sled tests, benefit cost considerations. A propos

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for future ESV specifications is presented along with future evaluations.

by H.-P. Willumeit
Volkswagenwerk A. G., Wolfsburg (West Germany)
Publ: HS-013 939, International Technical Conference on
Experimental Safety Vehicles, (4th), Kyoto, Japan, 1973 p109-
45
1973 ; 14refs
Availability: Bound in HS-013 939

HS-014 974

**NEW INVESTIGATIONS OF HUK ACCIDENT
RESEARCH: "INTERIOR SAFETY OF
AUTOMOBILES". THE FEDERAL REPUBLIC OF
GERMANY TECHNICAL PRESENTATION. SECT. 2,
PT. 2**

Interior safety of automobiles is the object of research by German automobile insurers. 27,500 accident cases contained such detailed data on accident circumstances, damage to passenger vehicles and occupant injuries that it was possible to subject them to a thorough, scientific analysis. The benefit of anti-locking systems is examined as to no benefit, benefit possible, benefit probable, or benefit certain. Division of these benefit categories according to accident situations indicates that importance must be attached to maintaining steerability and curtailing the braking distance on a wet roadway when evolving anti-locking systems. Driver reaction and collision speed are considered in determining an Equivalent Test Speed (ETS) range for test of vehicle safety in an effort to alleviate the number of vehicle accidents and occupant injuries.

by M. Danner
HUK-Verband (West Germany)
Publ: HS-013 939, International Technical Conference on
Experimental Safety Vehicles, (4th), Kyoto, Japan, 1973 p147-
53
1973
Availability: Bound in HS-013 939

HS-014 975

**TRAFFIC SAFETY COMPARISON OF VARIOUS
CLASSES OF COMMON FRENCH CAR MAKES AND
DRIVERS. THE FRENCH TECHNICAL
PRESENTATION. SECT. 2, PT. 3**

The safety of different classes of common French car makes and drivers is examined, including both pre-crash and post-crash safety, by analyzing the safety in terms of the rates of victims related to the distance covered. A judgment is made of the associated pairs (vehicle-driver) by taking into account both the age of the driver and the type of vehicle.

by C. Berlioz; B. Baylatry; C. Filou; M. Frybourg
France Secretariat d'Etat aux Transports, Paris
Publ: HS-013 939, International Technical Conference on
Experimental Safety Vehicles, (4th), Kyoto, Japan, 1973 p157-
60
1973
Availability: Bound in HS-013 939

HS-014 976

**A STUDY OF ANTI-LOCKING BRAKING SYSTEMS.
THE FRENCH TECHNICAL PRESENTATION. SECT.
2, PT. 3**

The effectiveness of the anti-locking braking system is determined by analyzing accident situations from files gathered in France from May, 1970 to June, 1971. Variables included type of accident, condition of road surface, make and type of vehicle involved, and driver behavior. The analytical method used showed that in all probability, equipping vehicles with an anti-locking system provides advantages in safety equivalent to their cost and perhaps greater, especially for high-range vehicles.

by C. Berlioz; F. Fernandez; A. Osselet
France Ministere de l'Equipement, Paris
Publ: HS-013 939, International Technical Conference on
Experimental Safety Vehicles, (4th), Kyoto, Japan, 1973 p161-
81
1973
Availability: Bound in HS-013 939

HS-014 977

**ESV SYNTHETIC DRAFT. THE FRENCH
TECHNICAL PRESENTATION. SECT. 2, PT. 3**

Most of the solutions developed on experimental safety subsystems are concentrated in the Safety Car studied by Peugeot. The aim is to find a technical compatibility between these subsystems which is bound to the economic imperatives of a cost-efficiency ratio adapted to the European market.

by J. Hamon
Automobiles Peugeot (France)
Publ: HS-013 939, Report on the 4th International Technical
Conference on Experimental Safety Vehicles, Kyoto, Japan,
1973 p185-96
1973
Availability: Bound in HS-013 939

HS-014 978

**RATING ACCIDENT SEVERITIES OF OCCUPANTS.
THE FRENCH TECHNICAL PRESENTATION. SECT.
2, PT.3**

Results from nearly 1000 accidents in France are compared with those from American samples to examine divergences arising from fundamental differences in the method for analyzing road observations. Significant parameters of accident severity for occupants are discussed. The present method of likening the speed variation to the wall collision speed that would give the same vehicle deformation is criticized, and a new method is derived, and applied to a partial sample of accidents for which the vehicle stress- deformation laws were known. The collision speed is calculated from the masses, the total deformation of both vehicles and the mean stress at a specific interface. It is concluded that a greater protection effi-

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ciency for restraining devices that are valid for speed variations of 50 km/h may be expected.

by C. Prost-Dame
Renault-Peugeot Assoc., La Garenne-Colombes (France)
Publ: HS-013 939, Report on the 4th International Technical Conference on Experimental Safety Vehicles, Kyoto, Japan, 1973 p197-200

Availability: Bound in HS-013 939

HS-014 979

PROPOSAL FOR TEST EVALUATION OF COMPATIBILITY BETWEEN VERY DIFFERENT PASSENGER CARS. THE FRENCH TECHNICAL PRESENTATION. SECT.2, PT.3

It is shown that equal chances of survival for the occupants of broadly differing vehicles in the event of mutual collision depend on solving complex problems and that the chances will never be completely equal. Extensive analysis of statistics and theoretical and experimental studies lead to the conclusion that it is not impossible to arrive at broad lines of research, in spite of the difficulties brought on by covering lateral collisions at the same time. General agreement between manufacturers or the introduction of regulations is suggested.

by P. Ventre
Renault-Peugeot Assoc., La Garenne-Colombes (France)
Publ: HS-013 939, International Technical Conference on Experimental Safety Vehicles, (4th), Kyoto, Japan, 1973 p201-9
1973 ; 7refs
Availability: Bound in HS-013 939

HS-014 980

PROGRESS REPORT ON THE SECOND PHASE OF RESEARCH AND EXPERIMENTATION ACTIVITIES. THE FRENCH TECHNICAL PRESENTATION. SECT. 2, PT. 3

Research and experimentation on a French experimental safety vehicle investigates structural design of a sub-subcompact vehicle and the behavior of passengers restrained by an active restraint system. Focus is on perpendicular frontal impact against a fixed barrier and perpendicular side impact. Anticipated performances are determined. Tests on a Dyane ATP, a vehicle derived from a Dyane sedan incorporating structural alterations to improve performance in frontal impacts, are reported. A mathematical model simulating dummy behavior during a frontal impact is derived, including a two-dimensional model with 11 degrees of freedom and a three-dimensional model with 40 degrees of freedom. Practical testing of belt restraint systems is reported, with consideration given to the effect of play and of shock absorption. Structural improvements are also described along with the mathematics of the acceleration curve.

by S. Bohers
Citroen S. A., Paris (France)
Publ: HS-013 939, International Technical Conference on Experimental Safety Vehicles, (4th), Kyoto, Japan, 1973 p213-32
1973
Availability: Bound in HS-013 939

HS-014 981

UNITED KINGDOM REQUIREMENTS FOR A PRACTICAL SAFETY CAR. THE UNITED KINGDOM TECHNICAL PRESENTATION, SECT. 2, PT. 4

United Kingdom requirements for the practical safety car are reviewed in terms of accident prevention, occupant protection, and pedestrian safety. Consideration is given to a variety of areas: safety car design basis; impact tests to demonstrate the level of occupant protection; test conditions and methods for full frontal and partial frontal barrier impact, side impact, and overturning; pedestrian protection; braking; handling requirements; failures, and instrument panel warning lights; life and serviceability of braking systems; test track surface frictional properties; lighting and visibility; design for durability and low operational costs; and front end design.

by D. Lister
Transport and Road Res. Lab., Crowthorne, Berks. (England)
Publ: HS-013 939, International Technical Conference on Experimental Safety Vehicles (4th), Kyoto, Japan, 1973 p235-45
1973
Availability: In HS-013 939

HS-014 982

THE U.K. APPROACH TO ANTHROPOMORPHIC DUMMY SPECIFICATIONS. THE UNITED KINGDOM TECHNICAL PRESENTATION, SECT. 2, PT. 4

A basic design philosophy is described which relates dummy design and performance to real life situations. The anthropomorphic dummy industry in the United Kingdom is reviewed and the need for new specifications cited. Design criteria include: humanlike behavior; repeatability; robustness and suitability for repeat testing; economy in use; compliance with performance specification; ease of adjustment and set up; and calibration against known real life accident data. A work program is described for head, neck, shoulder, chest, lumbar spine, pelvis, and femur/knee sections. Development work has proved that it is possible to attain practical standards of humanlike performance, combined with relative simplicity, robustness, and economy of manufacture. A 50th percentile test dummy to be used for compliance tests for cars manufactured to proposed motor vehicle safety requirements is specified in a draft outline. Instrumentation is included.

by P. S. Warner; M. A. Macaulay
Ogle Res. Ltd., Letchworth, Herts. (England); Motor Industry Res. Assoc., Lindley Nr. Nuneaton, Warwick (England)
Publ: HS-013 939, International Technical Conference on Experimental Safety Vehicles (4th), Kyoto, Japan, 1973 p247-59
1973
Availability: In HS-013 939

HS-014 983

BRITISH LEYLAND/TRRL EXPERIMENTAL SAFETY SUBSYSTEM CONTRACTS. THE UNITED KINGDOM TECHNICAL PRESENTATION, SECT. 2, PT. 4

British Leyland Motor Corporation's efforts in the development of several separate projects concerned with specific aspects of the experimental safety vehicle program are described. The projects include research on frontal impacts,

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side impacts, occupant protection, and steering assembly impacts.

by P. M. Finch
British Leyland Motor Corp. Ltd., London
Publ: HS-013 939, International Technical Conference on
Experimental Safety Vehicles (4th), Kyoto, Japan, 1973 p261-5
1973
Availability: In HS-013 939

HS-014 984

A REVIEW OF SEAT BELT EFFECTIVENESS AND INVESTIGATION OF POTENTIAL IMPROVEMENTS, INCLUDING PASSIVE SYSTEMS. THE UNITED KINGDOM TECHNICAL PRESENTATION, SECT. 2, PT. 4

Seat belt effectiveness and potential improvements, as well as the design of reasonably priced passive systems in the United Kingdom are outlined. Accident and injury data and injuries received by restrained and unrestrained occupants are discussed. The frequency of injury to various parts of the body is tabulated for a sample of 911 unrestrained, 71 three-point system restrained, and seven other belt system restrained occupants whose injuries were more severe than minor. It is concluded that seat belts have been shown to be very effective in preventing a large proportion of injuries sustained in car crashes, and particularly in reducing the incidence of head and chest injuries. Severity of seat belt induced injuries and their location is commented on. One specific passive seat belt system is described to illustrate design considerations. Laboratory work to improve seat belt performance is described, and areas of future research are indicated.

by P. Finch; W. Giffen
British Leyland Motor Corp. Ltd., London; Auto Restraint
Systems Ltd. (England)
Publ: HS-013 939, International Technical Conference on
Experimental Safety Vehicles (4th), Kyoto, Japan, 1973 p267-
73
1973 ; 5refs
Availability: In HS-013 939

HS-014 985

ESV TEST PROGRAM. THE UNITED STATES TECHNICAL PRESENTATION, SECT. 2, PT. 1

The status of experimental safety vehicle testing in the United States is described, with tests on Ford, General Motors, and Fiat vehicles reported. Details are given on post-crash factors, weights and dimensions, brake test results, pedal force, dummy head, chest, pelvic and femur performance, and vehicle response for front-to-front and front-to-rear impacts.

by N. S. Stahler; F. Arndt
National Hwy. Traf. Safety Administration, Washington, D.
C.; Dynamic Science, Phoenix, Ariz.
Publ: HS-013 939, International Technical Conference on
Experimental Safety Vehicles (4th), Kyoto, Japan, 1973 p279-
87
1973
Availability: In HS-013 939

HS-014 986

CONCLUSIONS AND PROJECTIONS ON ESV DEVELOPMENT. THE UNITED STATES TECHNICAL PRESENTATION, SECT. 2, PT. 5

The development and testing of General Motors experimental safety vehicle prototypes are reviewed, with comments included on recently published specifications and goals for a 3000-lb intermediate ESV. Areas for additional research in highway safety are suggested. Details are given on impact and rollover tests, noise prevention, occupant protection, passenger weight factors, mirror system, anti-lock brakes, message center concept, bumper requirements, rear signaling system, and injury prediction.

by L. C. Lundstrom
General Motors Corp., Detroit, Mich.
Publ: HS-013 939, International Technical Conference on
Experimental Safety Vehicles (4th), Kyoto, Japan, 1973 p289-
94
1973
Availability: In HS-013 939

HS-014 987

RESULTS OF THE FORD MOTOR COMPANY ESV DEVELOPMENT. THE UNITED STATES TECHNICAL PRESENTATIONS, SECT. 2, PT. 5

The final design configuration of the Ford experimental safety vehicle (ESV) is described, followed by a report of the results of significant crash tests and performance tests in the crash avoidance category. Experience gained from the Ford participation in the ESV program is summarized, and its future is examined. Details are given on interior package design; major components such as instrument panel, front end and bumpers, driver restraint system, vehicle weight; and braking, steering, and handling characteristics.

by J. D. Collins; K. H. Arning
Ford Motor CO., Dearborn, Mich.
Publ: HS-013 939, International Technical Conference on
Experimental Safety Vehicles (4th), Kyoto, Japan, 1973 p295-
305

Availability: In HS-013 939

HS-014 988

THE AMF ESV TRADEOFF AND INTEGRATION STUDIES PROGRAM. THE UNITED STATES TECHNICAL PRESENTATION, SECT. 2, PT. 5

The American Machine and Foundry Tradeoff and Integration Studies program for experimental safety vehicles is reviewed. The program determines various levels of performance over a range of design conditions, for a number of vehicle subsystems and for the total vehicle. Specific consideration is given to: passive, front occupant restraint system; driver's passive restraint system; wheel/cluster bag tests; modified tear drop bag tests; rear occupant restraint systems; front end studies; body structure studies; vehicle simulator for crash testing; major systems studies crashworthiness-weight tradeoff; vehicle dynamics math simulation; occupant restraint tradeoff;

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braking performance analysis; engine effects on safety performance; and rear visibility tradeoff.

by W. Rup
American Machine and Foundry Co., Santa Barbara, Calif.
Publ: HS-013 939, International Technical Conference on
Experimental Safety Vehicles (4th), Kyoto, Japan, 1973 p309-
15
1973
Availability: In HS-013 939

HS-014 989

**CRASHWORTHINESS-WEIGHT TRADEOFF STUDY.
THE UNITED STATES TECHNICAL
PRESENTATION, SECT. 2, pt. 5**

Several tasks studied in support of an optimized family sedan experimental safety vehicle (ESV) are reviewed. A discussion of the crashworthiness-weight tradeoff covers the task objective, the analytical model used as the basis of computer program, crash conditions used to design the baseline vehicle, and the results obtained. The basic objective was to provide a meaningful set of relationships between crashworthiness parameters and the vehicle system and subsystem weights. The successful re-test capability of the ESV in barrier impact tests is noted.

by W. Wingenbach
American Machine and Foundry Co., Santa Barbara, Calif.
Publ: HS-013 939, International Technical Conference on
Experimental Safety Vehicles (4th), Kyoto, Japan, 1973 p317-
24
1973
Availability: In HS-013 939

HS-014 990

**THE OPTIMIZED ESV PERFORMANCE
SPECIFICATIONS. THE UNITED STATES
TECHNICAL PRESENTATION, SECT 2, PT. 5**

The preliminary specifications and goals for a U. S. 3000-lb class experimental safety vehicle are reviewed. Focus is on the major performance criteria and changes from the original family sedan ESV requirements. The 3000-lb class sedan will be used to assess the effectiveness, practicality, and achievability of safety design concepts that could be incorporated into mass-produced vehicles of the 1980's. Specific consideration is given to: basic vehicle requirements; handling and stability in braking and steering; driver visibility and lighting; driver environment; crash energy management; occupant compartment; and systems producibility.

by W. E. Scott
National Hwy. Traf. Safety Administration, Washington, D. C.
Publ: HS-013 939, International Technical Conference on
Experimental Safety Vehicles (4th), Kyoto, Japan, 1973 p325-
31
1973
Availability: In HS-013 939

HS-014 991

**STEERABILITY DURING EMERGENCY BRAKING.
THE SWEDISH TECHNICAL PRESENTATION, SECT.
2, PT. 6**

The Swedish experimental safety vehicle program, an investigation of steerability during emergency braking, is divided into four task groups: accident investigation; simulation testing by mathematical model; and performance and statistical field testing. Objectives of the accident investigation task were: to find the percentage of locked wheel accidents; to find typical situations for locked-wheel accidents; and to estimate possible benefits if steerability during braking had been possible. Simulation testing objectives were to complement field tests and to perform a systematic investigation of the influence of typical anti-skid parameters. The field performance tests investigated the relationship between braking and steering capability under various vehicle characteristics and equipment, and road, speed, and load conditions in various maneuvers. The statistical tests sought to determine how an average driver behaves during an emergency situation and whether or not having steerability works to his advantage.

by S. Rundkvist
Volvo A.B., Goteborg (Sweden)
Publ: HS-013 939, International Technical Conference on
Experimental Safety Vehicles (4th), Kyoto, Japan, 1973 p335-9
1973
Availability: In HS-013 939

HS-014 992

**CHASSIS PARAMETER INFLUENCE ON HANDLING
CHARACTERISTICS. COMPUTER SIMULATIONS
FOR THE VOLVO EXPERIMENTAL SAFETY CAR.
THE SWEDISH TECHNICAL PRESENTATION, SECT.
2, PT. 6**

A computer simulation is described which indicates the influence of different vehicle parameters on handling and stability, based on the requirements in the experimental safety vehicle specifications. The basic concept and different chassis systems for the Volvo Experimental Safety Car (VESC), such as suspension and steering systems, are also described. The mathematical model used has five degrees of freedom. Consideration is given to yaw response and crosswind sensitivity. It is concluded that the experimental safety vehicle requirements should take the fully-loaded condition into consideration since the loading conditions can be affected by the driver.

by F. Jaksch
Volvo A.B., Goteborg (Sweden)
Publ: HS-013 939, International Technical Conference on
Experimental Safety Vehicles (4th), Kyoto, Japan, 1973 p341-
53
1973
Availability: In HS-013 939

HS-014 993

**A STATISTICAL TRAFFIC ACCIDENT ANALYSIS.
THE SWEDISH TECHNICAL PRESENTATION, SECT.
2, PT. 6**

A statistical analysis based on accident data of Volvo vehicles

presented, consisting of information about the accident and traffic environment, vehicle data, the occupants and injuries sustained. The value of various restraint items such as safety belts, including retractor belts and head restraints, is stressed. An evaluation is also included of the accident cases in view of applicable requirements of the Volvo Experimental Safety Car specifications. Case reports of 31 fatal accidents are given, showing accident type, fatalities, fatality causes, collision speed, and seat belt use.

by A. Asberg
Volvo A.B., Goteborg (Sweden)
Publ: HS-013 939, International Technical Conference on Experimental Safety Vehicles (4th), Kyoto, Japan, 1973 p359-91
1973 ; 2refs
Availability: In HS-013 939

HS-014 994

ROAD ACCIDENT INVESTIGATION--ACCIDENTS IN SWEDEN WITH SAAB 99, REPORT FROM FIRST PHASE. THE SWEDISH TECHNICAL PRESENTATION, SECT. 2, PT. 6

Some 1523 road accidents in Sweden involving Saab 99 vehicles are examined in terms of damage severity, occupant injury, and cause of injury. Data and charts are given on: accident distribution versus repair costs; vehicle model year; accident location and type; speed limit; impacted objects; impact direction; interior deformation; seat belt usage; interior modifications (instrument panel); crash severity; unrestrained occupant injury; driver and passenger injury localization; treatment; and time of rehabilitation.

by H. Gustavsson
Saab-Scania A.B., Sodertalje (Sweden)
Publ: HS-013 939, International Technical Conference on Experimental Safety Vehicles (4th), Kyoto, Japan, 1973 p393-407
1973
Rept. on data collected from 1 May 1971-30 Apr 1972 and from 1 sep 1972-30 Nov 1972.
Availability: In HS-013 939

HS-014 995

PROGRESS REPORT FOR THE EXPERIMENTAL INSTITUTE FOR MOTOR VEHICLES (ISAM). THE ITALIAN TECHNICAL PRESENTATION, SECT. 2, PT. 7

The amplitude and intensity of the vibrations found in a motor vehicle are examined by ascertaining the presence and entity of the vibrations on two separate test vehicles. Three test situations show the effects of the low frequencies found in a vehicle, their respective amplitude, and their distribution in the various situations. This report is intended to be the first part of a full statistical investigation which may be extended to all other fields of frequency up to the ultrasonic.

by F. Moscarini
Alfa Romeo S.A., Milan (Italy)
Publ: HS-013 939, International Technical Conference on Experimental Safety Vehicles (4th), Kyoto, Japan, 1973 p411-51973
Availability: In HS-013 939

HS-014 996

FURTHER RESEARCH ON THE DRIVER/VEHICLE SYSTEM. STUDY OF A ROUGH-SURFACE STEERING PAD. THE ITALIAN TECHNICAL PRESENTATION. SECT. 2, PT. 7

Progress is reported on research on the driver/vehicle system and the definition of a surface having a rough profile for road-holding tests. The mathematical model of the driver/vehicle interface is described, taking into consideration the contribution of the curbs, the driver's estimate of the future point position, and the driver's characteristics, including reaction time. An experimental verification of the model is reported, including the overtaking maneuver, vehicle test equipment, and vehicle characteristics and schematization. Experimentation to date has given useful results. However, as the phenomenon is very complex, the mathematical model will undergo further modifications and hence become more complicated while the basic structure will remain unaltered.

by L. Chidini; A. Schieppati
Alfa Romeo S.P.A. Milan (Italy)
Publ: HS-013 939, Report on the 4th International Technical Conference on Experimental Safety Vehicles, Kyoto, Japan, 1973 p417-24
1973
Availability: Bound in HS-013 939

HS-014 997

PROGRESS IN THE DEFINITION OF AN UNEVEN SURFACE STEERING PAD FOR ROAD-HOLDING TESTS. THE ITALIAN TECHNICAL PRESENTATION. SECT. 2, PT. 7

Results of tests carried out on experimental test surface steering pads are reported and indications are suggested for a better definition of the possible characteristics of a standardized test surface. The tests were carried out on an asphalted, level, steering pad annulus, having 19 m internal radius and 8 m width. The need is noted for continuity of the obstacles from one end of the steering pad to the other, so that the possibility of exciting independently the left- and right-hand wheels is greatly limited. Test repeatability is mentioned. The scatter of the results taken on the rough surface is shown to be of the same order of amplitude as the one obtained on a smooth surface. Correlation between a smooth and rough surfaced steering pad is described, along with Alpha Romeo's development of a rough steering pad.

by L. R. Rossini; A. Schieppati
Alpha Romeo S.P.A. Milan (Italy)
Publ: HS-013 939, International Technical Conference on Experimental Safety Vehicles, (4th), Kyoto, Japan, 1973 p425-30
1973
Availability: Bound in HS-013 939

HS-014 998

FRONTAL IMPACT--A THEORETICAL ANALYSIS OF THE HEAD AND NECK OF A PASSENGER WEARING SAFETY BELTS--THE STUDY OF THE EFFECTS OF A HEAD RESTRAINT SYSTEM. THE

ITALIAN TECHNICAL PRESENTATION. SECT. 2, PT. 7

A 40 mph frontal impact against a rigid barrier is examined in terms of head and neck injury to a passenger wearing safety belts. The possibility is shown of keeping the torso decelerations below 60 g for a frontal crash at 40 mph, assuming 550 mm as the useful crushing distance of the front of the vehicle. The calculated stresses in the head and neck of the passenger with safety belts but without a head restraint device were extremely high, but very low with the head restraint device. It is noted that the results were obtained assuming a critically damped, elastic head restraint system which may be difficult to achieve in practice. Elastic systems having lower damping effects will give less favorable but still interesting results.

by M. Garetti; I. Poletti; A. Schieppati

Alpha Romeo S.P.A. Milan (Italy)

Publ: HS-013 939, Report on the 4th International Technical Conference on Experimental Safety Vehicles, Kyoto, Japan, 1973 p431-7
1973

Availability: Bound in HS-013 939

HS-014 999

EASY BELT--SOFT SALLT SEAT. THE ITALIAN TECHNICAL PRESENTATION. SECT. 2, PT. 7

An occupant restraint system using sophisticated passive belts working in conjunction with a head restraint device is described. Emphasis is on what happens to the occupant himself. The traditional 3-point belt system is modified by Alpha Romeo to enable the occupant to use the belt easily and automatically. The system consists of two moving arms, each with one end hinged about halfway up the seat back, with fitted lap belt retractors at the other extremities of the arms. An emergency locking retractor under the seat is also included. The soft sallet head restraint device aims at restraining the head, in its movement relative to the torso, by means of a woven curtain which would automatically position itself in front of the occupant's head in case of an accident.

by C. B. Anderloni; A. Schieppati

Alpha Romeo S.P.A. Milan (Italy)

Publ: HS-013 939, Report on the 4th International Technical Conference on Experimental Safety Vehicles, Kyoto, Japan, 1973 p439-41
1973

Availability: Bound in HS-013 939

HS-015 000

PROGRESS REPORT OF THE ESV DEVELOPMENT AT FIAT. THE ITALIAN TECHNICAL PRESENTATION. SECT. 2, PT. 7

Fiat reports on analysis of road accidents in which Fiat-built cars were involved. The most frequent type of accident is the front-end collision, followed in decreasing order of frequency, by side collision, rear-end collision and rollover. 80% of the accidents cause, on an average, moderate to severe damage to cars, and 80% of the accidents cause, on an average, light injuries to occupants. Present on-going research to define objectively what should be meant by a "safe vehicle" concerns vehicle handling and braking; experimental safety vehicles of 1500-lb., 2000-lb., and 2500-lb weight; restraint systems; and compatibility in impact. The development of the first experi-

mental safety vehicle (ESV) prototypes in the three weight classes enabled Fiat to evaluate, as realistically as possible, the consequences of compliance with the requirements of the ESV specification. Such consequences are rather serious for smaller economic cars of the European type. However, tests have shown that the problems of the survival space and of low speed protection are technically solvable, but at the expense of still acceptable size increases and of cost increases which are not likely to be less than 40%.

by V. Montanari

Fiat S. P. A., Turin (Italy)

Publ: HS-013 939, Report on the 4th International Technical Conference on Experimental Safety Vehicles, Kyoto, Japan, 1973 p443-75
1973

Availability: Bound in HS-013 939

HS-015 001

STEERING, HANDLING AND BRAKING. ACCIDENT AVOIDANCE SEMINAR. SECT. 3, PT. 2

Steering, handling, and braking performance requirements for experimental safety vehicles are described. Tests are reported on power-assist controls, tire wet traction, tire cornering stiffness, and vehicle evasive performance. It is concluded that vehicles are improving to meet traffic system demands and that there is evidence of uniformity in handling quality of current production vehicles. It is suggested that improved causation information be obtained to aid in selecting safety related handling tests and to establish the cost effectiveness of handling standards, that the task-performance approach to handling standards be more thoroughly evaluated, and that advanced driver education in maneuvering skills be employed.

by J. Rosenkrands

General Motors Corp., Detroit, Mich.

Publ: HS-013 939, Report on the 4th International Technical Conference on Experimental Safety Vehicles, Kyoto, Japan, 1973 p497-501
1973

Availability: Bound in HS-013 939

HS-015 002

STEERING, HANDLING AND BRAKING. SAFER BRAKING SYSTEMS. ACCIDENT AVOIDANCE SEMINAR. SECT. 3, PT. 2

Increasing legislative requirements are reviewed against the practical experience of the motor industry and the theoretical investigations of scientists, so that the practicing automotive engineer may appreciate the current state-of-the-art of braking systems and the progress toward improved road safety. Braking regulations in the U. S., Sweden, and the European Economic Community are outlined. Methods of reducing the incidence and effects of brake failures are discussed, including periodic inspections, accident investigations, divided circuits, and warning indicators. Stopping performance improvements are considered, as are vehicle braking dynamics, in terms of proportioning valves, adhesion utilization, locked wheels, and

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HS-015 007

rear- or four-wheel control. Further consideration is given to anti-locking brake systems.

by B. Ingram; P. Oppenheimer
Girling Ltd., Birmingham, Warwick (England)
Publ: HS-013 939, Report on the 4th International Technical Conference on Experimental Safety Vehicles, Kyoto, Japan, 1973 p505,16
1973 ; 3refs
Availability: Bound in HS-013 939

HS-015 003

STEERING, HANDLING AND BRAKING. HOW GOOD IS THE BRAKING EFFICIENCY AS A CRITERION FOR EVALUATION OF A SYSTEM? SYSTEM

Braking efficiency is examined as an effective criterion for brake system evaluation. Details are given on: nomenclature, dimensions and indices; braking efficiency mathematics; increase of retardation in excess of wheel lockup at the front axle; vehicle stability; major factors influencing brake system design disregarded by the braking efficiency; fluctuations of the coefficient of friction of brake and lining; effect of engine braking moment and of inertia moments; and effects of vehicle loading. It is concluded that the braking efficiency as a basis for evaluating passenger cars is inappropriate and dangerous since a development can be initiated which may lead to brakewise unstable vehicles.

by E.-C. V. Glasner
Daimier-Benz A. G., Stuttgart (West Germany)
Publ: HS-013 939, Report on the 4th International Technical Conference on Experimental Safety Vehicles, Kyoto, Japan, 1973 p525-9
1973 ; 15refs
Availability: Bound in HS-013 939

HS-015 004

SIMULATION OF ROAD TRAFFIC ACCIDENTS WITH BARRIER IMPACT TESTS. CRASHWORTHINESS SEMINAR, SECT. 4, PT. 2

The frontal barrier test for restraint system assessment with test dummies is examined in terms of its compatibility with current knowledge. Problems associated with simulation of side collisions are noted, and it is shown that very few road accidents are equivalent to crashing the vehicle against a non-deforming barrier. Energy absorption in frontal side, and rear-end collisions is described. An approach is outlined for attaining test compatibility, including investigation of vehicle deformation characteristics, development of test methods and performance criteria, and technical solutions for installation in the vehicles.

by U. W. Seiffert
Volkswagenwerk A. G., Wolfsburg (West Germany)
Publ: HS-013 939, International Technical Conference on Experimental Safety Vehicles (4th), Kyoto, Japan, 1973 p543-7
1973 ; 6refs
Availability: In HS-013 939

HS-015 005

PROPOSAL FOR METHOD OF ANALYZING COLLISION SPEEDS IN REAL ACCIDENTS. CRASHWORTHINESS SEMINAR, SECT. 4, PT. 2

A method of evaluation of collision speed in real accidents is presented, based on the stress-deformation laws for each vehicle, instead of the one generally accepted which is based on comparing the deformation of the vehicle involved in the accident with the same deformation obtained in a collision with a fixed and rigid obstacle. The method is applied to actual cases, leading to a classification of collision severities that is appreciably different from what it would have been by applying the comparison method. The application shows that the passenger compartment stopping distances with relation to the ground are greater in real accidents than they would have been in a collision with a fixed barrier, changing the severity of the collision for the occupant.

by P. Ventre; J. Provensal
Renault State-Owned Works (France)
Publ: HS-013 939, International Technical Conference on Experimental Safety Vehicles (4th), Kyoto, Japan, 1973 p549-59
1973 ; 4refs
Availability: In HS-013 939

HS-015 006

CAR-TO-CAR COMPATIBILITY. CRASHWORTHINESS SEMINAR, SECT. 4, PT. 2

Approaches to front end energy management for lessening car-to-car impact severity are reviewed and related to the international experimental safety vehicle program. Simplified basic considerations are discussed and specific concepts are detailed, including: fixed force; ramped fixed force; hydraulic systems; and hybrid systems. Conclusions are reached regarding traffic aggressiveness, vehicle size, system tradeoffs and comparisons, crash conditions, restraint compatibility with structural response, and manufacturing goals.

by E. M. Chandler
National Hwy. Traf. Safety Administration, Washington, D. C.
Publ: HS-013 939, International Technical Conference on Experimental Safety Vehicles (4th), Kyoto, Japan, 1973 p587-91
1973 ; 14refs
Availability: In HS-013 939

HS-015 007

BRAKING, HANDLING AND STEERING. THE JAPANESE TECHNICAL PRESENTATION, SECT. 2, PT. 1

Braking, handling, and steering tests on the Toyota experimental safety vehicle are presented. Consideration is given to wind tunnel tests, tire characteristics and measurement, cornering force and self-aligning torque of prototype tires, skid control, hydraulic boosters, four-wheel disc brakes, deceleration, brake

pedal force, yaw response, steering wheel returnability, acceleration and breakaway, and crosswind sensitivity.

by T. Baba

Toyota Motor Co. Ltd., Kariya (Japan)

Publ: HS-013 939, International Technical Conference on Experimental Safety Vehicles (4th), Koyoto, Japan, 1973 p35-41

1973

Availability: In HS-013 939

HS-015 008

THE CATALYTIC REDUCTION OF NITRIC OXIDE IN AUTOMOBILE EXHAUST GASES--1. TESTS OF IRON-CONTAINING MATERIALS

The efficiencies of iron-containing catalysts for the reduction of nitric oxide in simulated and real exhaust gases are reported. The catalyst bed was seven times the swept volume of the engine. The best results were obtained when the engines were run about 10% rich of stoichiometric. The rate at which the catalyst was poisoned by conventional fuel additives was shown to be reduced by raising the working temperature of the reactor.

by D. R. Jenkins; M. A. Voisey

Publ: Atmospheric Environment v7 p177-86 (1973)

1973 ; 7refs

Availability: See publication

HS-015 009

THE CATALYTIC REDUCTION OF NITRIC OXIDE IN AUTOMOBILE EXHAUST GASES--2. THE KINETICS OF THE REACTIONS OF CARBON MONOXIDE WITH NITRIC OXIDE AND/OR OXYGEN ON AN OXIDIZED STAINLESS-STEEL SURFACE

A flow-tube reactor has been used to examine the kinetics of the catalyzed reactions of carbon monoxide with nitric oxide and/or oxygen on a steel surface. The order of the reaction has been determined and a reaction mechanism proposed. The inhibiting effect of oxygen on the reduction of nitric oxide is analyzed, and the pertinence of these results to the treatment of automobile exhaust gases is discussed.

by D. R. Jenkins; M. A. Voisey

Publ: Atmospheric Environment v7 p187-99 (1973)

1973 ; 4refs

Availability: See publication

HS-015 010

LITERATURE SURVEY OF TIRE-ROAD EXPERIMENTS. TIRE TRACTION CHARACTERISTICS AFFECTING VEHICLE PERFORMANCE. INTERIM DOCUMENT 1 (REV.)

A literature survey is presented which is restricted to publications reporting the results of tests performed with real tires on actual road surfaces. The objective was to identify and summarize a compact source of reference material believed to contain most of the current knowledge derived from on-the-road testing of automobile and aircraft tires. Some 38

references are individually summarized in a standard format outlining goal of tests, equipment used, road surfaces, tires tested, test procedure, techniques for analyzing and presenting data, and conclusions.

by J. F. Sinnamon

Michigan Univ., Ann Arbor. Hwy. Safety Res. Inst.

Rept. No. UM-HSRI-PF-74-5; PB-229 893 ; 1974 ; 143p 38refs

Sponsored by the Motor Vehicle Mfrs. Assoc., Detroit.

Availability: NTIS \$4.75

HS-015 011

INTERNATIONAL RESEARCH COMMITTEE ON BIOKINETICS OF IMPACTS (IRCOBI)

Aims of the International Research Committee on Biokinetics of Impacts are to encourage the exchange of information and the planning of cooperative research at an international level on the biokinetics of impacts over the next 10-15 years. Emphasis is on improving the scientific information on which safety standards and the planning of ground transport safety should be based.

by B. Aldman

Chalmers Tekniska Hogskola, Goteborg (Sweden)

Publ: International Conference on the Biokinetics of Impacts.

Proceedings p3-9 (Jun 1973)

1973

Conference held in Amsterdam, 26-27 Jun 1973.

Availability: National Road Safety Organization, Ave. du

General Mallert-Joinville 94 Arcueil, France

HS-015 012

THE EPIDEMIOLOGY OF INJURY--A REVIEW

The relative proportions of the major groups of injured road users are outlined for a selection of countries, and pedestrian, motorcyclist and occupant injuries are described according to body location. Studies from different parts of the world provide consistent descriptions of these injuries. Reference is made to trauma caused by other and new transport modes, and it is suggested that in the future more attention should be paid to describing the etiology of injuries in general and traffic trauma in particular.

by G. M. Mackay

Birmingham Univ. (England). Dept. of Transp. and Environmental Planning

Publ: International Conference on the Biokinetics of Impacts.

Proceedings p11-25 (Jun 1973)

1973 ; 26refs

Conference held in Amsterdam, 26-27 Jun 1973.

Availability: National Road Safety Organization Avenue du

General Mallert-Joinville 94 Arcueil, France

HS-015 013

THE FREQUENCY AND SEVERITY OF INJURIES TO THE OCCUPANTS OF CARS SUBJECTED TO DIFFERENT TYPES OF IMPACT IN ACCIDENTS: AN INVESTIGATION OF BRITISH ROAD ACCIDENTS FROM POLICE RECORDS

Results of an investigation of the importance of different types of impact in 1596 British accidents are presented. Some findings of theoretical analysis are given first. Urban-rural

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comparisons are made, and the severity of various types of impacts is examined. The risk of serious injury and death is particularly high in all collisions with commercial vehicles, especially in rural areas; severities in frontal impacts of cars against other cars are in the order expected from the relative impact velocities. Other details are given on intersection collision injuries as well as those in rear-end, single car, and overturned vehicle accidents. Characteristics of the accidents are provided.

by G. Grime; I. S. Jones
University Coll., London (England). Res. Group in Traf.
Studies
Publ: International Conference on the Biokinetics of Impacts.
Proceedings p27-36 (Jun 1973)
1973 ; 4refs
Conference held in Amsterdam, 26-27 Jun 1973. Paper
supported by the Science Res. Council (England).
Availability: National Road Safety Organization Avenue du
General Mallert-Joinville 94 Arcueil, France

HS-015 014

INJURY PATTERNS ACCORDING TO CRASH CONFIGURATION

Data from 520 accident reports by specially trained accident investigation teams from nine European and North American nations are examined with respect to injury production and injury severity for various common vehicle damage patterns. Statistical charts, graphs, and tables illustrate the findings. Significant phases in the data base are presented. Statistical procedures are given showing the feasibility of using international traffic accident data collected according to a standard format.

by J. R. Cromack; G. M. Barnwell; E. E. Flamboe; H. Perring
Committee on the Challenges of Modern Society, Brussels
(Belgium)
Publ: International Conference on the Biokinetics of Impacts.
Proceedings p37-42 (Jun 1973)
1973
Conference held in Amsterdam, 26-27 Jun 1973.
Availability: National Road Safety Organization Avenue du
General Mallert-Joinville 94 Arcueil, France

HS-015 015

TRAFFIC ACCIDENTS AND INJURY EVALUATION BASED UPON A COORDINATED DATA COLLECTING SYSTEM.

Insecurity of traffic in a district is measured by the accident rate as a function of the population, traffic intensity, and other variables. Accident data are collected from insurance companies, police, and hospitals in the Scandinavian area. The reliability of the accident-describing data is found acceptable, and the value of the severity grouping of the lesions has been controlled for selected groups and found acceptable. The material is used by town planners, especially for determining the geographical distribution of accidents which inflict lesions on un-

protected road users. Tables are presented on accident characteristics, diagnosis, and injury severity.

by E. L. Nordentoft; T. Dalby; E. A. Petersen
Odense Univ. Hosp. (Denmark)
Publ: International Conference on the Biokinetics of Impacts.
Proceedings p43-8 (Jun 1973)
1973 ; 4refs
Conference held in Amsterdam, 26-27 Jun 1973.
Availability: National Road Safety Organization Avenue du
General Mallert-Joinville 94 Arcueil, France

HS-015 016

AN ANALYSIS OF FATAL CAR CRASHES IN WHICH THE VICTIM WAS WEARING A SEAT BELT

A group of seat belt wearers killed in Australian road traffic crashes is examined, with some demographic similarities and differences studied between those killed and the population from which they were selected. The number and type of all significant injuries of the deceased seat belt wearers are compared with a sample of deceased crash victims killed in the same number of crashes of the same type but not wearing belts. It is shown that an in-depth perspective study could be useful in investigating the mechanism of injuries sustained by seat belt wearers, with particular attention drawn to fractures and dislocations of the cervical vertebrae. It is suggested that the fact that there is more than one serious head injury per seat belt wearer fatality indicates incorrect adjustment which allows windshield contact.

by E. Rubinstein
Victoria Dept. of Health, Melbourne (Australia)
Publ: International Conference on the Biokinetics of Impacts.
Proceedings p49-58 (Jun 1973)
1973 ; 2refs
Conference held in Amsterdam, 26-27 Jun 1973.
Availability: National Road Safety Organization Ave. du
General Mallert-Joinville 94 Arcueil, France

HS-015 017

FATAL TRAFFIC ACCIDENTS IN MEDELLIN, COLOMBIA, SOUTH AMERICA

A study of fatal traffic accidents in Medellin, Colombia, shows that the highest risk population is composed of pedestrians, while passengers and drivers are relatively lower-risk categories. One-half of the victims die of cranioencephalic traumas. Most accidents were found to occur in higher speed roads which also have a large flow of pedestrians.

by C. A. Giraldo
Antioquia Univ., Medellin (Columbia). School of Medicine
Publ: International Conference on the Biokinetics of Impacts.
Proceedings p59-72 (Jun 1973)
1973 ; 4refs
Conference held in Amsterdam, 26-27 Jun 1973.
Availability: National Road Safety Organization AVE. DU
General Mallert-Joinville 94 Arcueil, France

HS-015 018

CLINICAL CAUSES OF DEATH IN DIFFERENT CATEGORIES OF ROAD USER

The clinical causes of death in 289 victims of road accidents are discussed. The leading cause of death among vehicle occupants was injury to the chest and among pedestrians and cyclists injury to the head: motorcyclist injuries to head and chest were equally common. Asphyxia was the primary cause of death in 9% of the fatalities. Among vehicle occupants, the principle sources of fatal injury to the chest were the steering wheel and column assembly and the facia panel in frontal impacts, the A and B posts and the doors in side impacts; and for the head, the roof and header rail, in frontal impacts.

by E. Grattan; N. G. Clegg

Road Res. Lab., Crowthorne, Berks. (England)

Publ: International Conference on the Biokinetics of Impacts Proceedings. p73-81 (Jun 1973)

1973 ; 4refs

Conference held in Amsterdam, 26-27 Jun 1973.

Availability: National Road Safety Organization Ave. du General Malleret-Joinville 94 Arcueil, France

HS-800 973

ALCOHOL SAFETY ACTION PROJECTS. EVALUATION OF OPERATIONS--1972. VOL. 1: SUMMARY

Results from the first year of operations by the 29 Alcohol Safety Action Projects (ASAPs) covered in this report indicate the success in generating countermeasure activity as shown by large increases in alcohol-related traffic arrests, cases processed by the courts, and drinking drivers in rehabilitation programs. In addition, projects have demonstrated success in serving as the community focal point and coordination center for a systematic attack on the problem of drunk driving. Data from conducted roadside surveys of the blood alcohol concentrations of nighttime drivers indicate a reduction in the number of motorists with high blood alcohol concentrations. Nighttime fatal crashes were used as the best criterion measure of project impact, since the improvements in data collection produced by the ASAPs reduced the usefulness of other measures (such as the blood alcohol concentration of fatally injured drivers) as indicators of project effectiveness. Analysis of quarterly data for the 8 ASAPs which began in January 1971 shows a statistically significant drop in the number of nighttime fatal crashes during project operations. The 21 projects operational for one year did not demonstrate a statistically significant reduction in nighttime fatal crashes. In individual evaluation reports, 7 out of 29 sites reported statistically significant reductions in one or more categories of crash data. This report contains conclusions and recommendations for improving the effectiveness of activities in each of the major countermeasure areas.

National Hwy. Traf. Safety Administration, Washington, D. C. 1972 ; 69p

Availability: Corporate author

HS-801 038

A TRAFFIC SAFETY DEMONSTRATION PROGRAM FOR MEMPHIS AND SHELBY COUNTY, TENNESSEE. FINAL REPORT

The steps and procedures used to design and apply an area-wide systems approach to highway safety management in a representative metropolitan area (Memphis and Shelby County, Tennessee) are described. Major steps include: organization of a Traffic Coordinating Committee; development and use of a Cooperative Management System; development and implementation of an Accident Information System; traffic safety problem identification and prioritization; and countermeasure implementation. Through a critique of each phase of the project, the report provides guidance to communities considering ways to foster area-wide highway traffic safety management.

Memphis and Shelby County Traf. Safety Coordinating Com., Tenn.

CONTRACT FH-11-7544

1973 ; 233p

Report for Jul 1970 - Dec 1973.

Availability: Reference copy only

HS-801 061

PASSENGER CAR DIRECTIONAL CONTROL TEST PROGRAM. FINAL REPORT

The effects of various antilock system configurations on the directional control of passenger cars are documented. The tests were conducted on straight and curved paths with high, medium, and low friction coefficient surfaces. To isolate the effects of the antilock systems, one test vehicle was tested with the following antilock systems: no antilock; drive shaft controlled rear; select-low rear; select-low front and rear; independent front, select-low rear; four-wheel independent. Two other vehicles were tested with and without a drive shaft-controlled rear antilock system to assess the effects of vehicle dynamics. It is shown that the four-wheel independent configuration performs best from a safety standpoint and that vehicle dynamics effect the performance of the antilock system.

by R. C. Boyer; E. Enserink

Ultrasystems, Inc., Phoenix, Ariz. Dynamic Science Div.

CONTRACT DOT-HS-046-3-667

Rept. No. 2310-73-161 ; 1973 ; 251p

Rept. for May-Dec 1973.

Availability: NTIS

HS-801 084

SCHOOL BUS DRIVER INSTRUCTIONAL PROGRAM. COURSE GUIDE

A guide is presented to assist course administrators and instructors in the preparation for and conduct of the School Bus Driver Instructional Program. A unit-by-unit specification is given for required instructor resources which identify the major equipment, references, handout material, and media required to localize the units. The overall purpose of the course is to provide in one package a program for developing the minimum (core) skills and knowledge needed by the school bus driver, and those supplemental (or advanced) skills and knowledge which the proficient driver might require. The core

materials cover introduction to school bus driver role and responsibility; passenger control; accidents and emergencies; bus maintenance and inspection; and driving fundamentals. Advanced unit topics include emergency driving techniques, transporting exceptional students and control of the bus. Emphasis in all course materials is upon those aspects of driving a school bus which are different from those for driving an automobile or which are critical for the safe operation of the pupil transportation system.

Applied Science Associates, Inc., Valencia, Pa.
CONTRACT DOT-HS-339-3-652
1974 ; 53p 31refs
Availability: GPO \$0.95

HS-801 085

SCHOOL BUS DRIVER INSTRUCTIONAL PROGRAM. INSTRUCTOR'S GUIDE

The instructor's guide to a school bus driver instructional program is presented in the form of five core units of study. They deal with: an introduction to school bus driver role and responsibility; passenger control; accidents and emergencies; bus maintenance and inspection; and driving fundamentals. Review questions and answers are given.

Applied Science Associates, Inc., Valencia, Pa.
CONTRACT DOT-HS-339-3-652
1974 ; 224p 18refs
Availability: GPO \$2.45

HS-801 086

SCHOOL BUS DRIVER INSTRUCTIONAL PROGRAM. INSTRUCTOR'S GUIDE--ADVANCED UNIT

An instructor's guide for an advanced unit of a school bus driver instructional program is presented. Topics covered include: emergency driving techniques; first aid; field trips; transporting exceptional (handicapped) students; detecting hazards; controlling the position of the bus; driving under special conditions such as rural or urban highways, night driving, adverse weather, reduced visibility, and expressway driving; and preventive maintenance of the bus. Review questions and answers are given.

Applied Science Associates, Inc., Valencia, Pa.
CONTRACT DOT-HS-339-3-652
1974 ; 314p 13refs
Availability: GPO \$4.45

HS-801 087

SCHOOL BUS DRIVER INSTRUCTIONAL PROGRAM. TRAINEE STUDY GUIDE

A trainee study guide for a school bus driver instructional program is presented with five sections on basic skills necessary. These include: introduction to school bus driver role and responsibility; passenger control; accidents and emergencies;

bus maintenance and inspection; and driving fundamentals. Review questions and answers are given.

Applied Science Associates, Inc., Valencia, Pa.
CONTRACT DOT-HS-339-3-652
1974 ; 222p 18refs
Availability: GPO \$3.75

HS-801 088

SCHOOL BUS DRIVER INSTRUCTIONAL PROGRAM. TRAINEE STUDY GUIDE--ADVANCED UNIT

A trainee study guide for an advanced unit of a school bus driver instructional program is presented which deals with several topics, including: emergency driving techniques; first aid; field trips; transporting exceptional or handicapped children; detecting hazards; controlling the position of the bus; driving under special conditions such as rural or urban highways, adverse weather, reduced visibility, night driving, and expressway driving; and preventive maintenance of the bus. Review questions and answers are given.

Applied Science Associates, Inc., Valencia, Pa.
CONTRACT DOT-HS-339-3-652
1974 ; 314p 13refs
Availability: GPO \$4.45

HS-801 089

REVISION AND UPDATE OF TRAFFIC SAFETY MANPOWER TRAINING PROGRAM DEVELOPMENT GUIDE. FINAL REPORT

A project is described to develop a guide which provides an organizational schema illustrating the functions that must be performed, and the interrelationship of them, to carry out highway traffic safety programs. A review of the literature and a bibliography are reported. Major conclusions were: non-environmental traffic safety program objectives can be achieved through an adequate supply of competent manpower performing the identified functions; functions required in one functional area are similar or identical to functions within other areas, so that with minimum training, individuals could perform in several functional areas; and there is a variety of traffic safety related functions being performed in numerous agencies and organizations under a variety of job titles.

by A. C. Hayes; N. V. Corwell; R. D. Daugherty; S. C. Reed
Center for Vocational and Technical Education, Columbus, Ohio
CONTRACT DOT-HS-115-3-647
1974 ; 196p refs
Rept. for 1 Apr 1973-Feb 1974.
Availability: NTIS

HS-801 111

STATISTICAL INFERENCE FROM MULTIDISCIPLINARY ACCIDENT INVESTIGATION. FINAL REPORT

Multidisciplinary accident investigation (MDAI) reports generated by more than 20 contractors are compiled in digital form for analysis. Methods for drawing inferences regarding the relationship between crash severity and injury severity in

the face of poorly defined samples are presented. The problems of determining accident and injury causation factors are discussed. Certain sub-sets of the MDAI data, particularly when considered with police-reported accident information from the same jurisdictions, can be used to estimate the frequency of occurrence of some phenomena of interest. Finally a plan is presented for a modification of the present (MDAI program which should achieve both a statistically representative sample of accidents for a large portion of the United States and a capability to conduct special short-term studies to answer specific questions.

by J. O'Day; W. L. Carlson; R. Douglass; R. J. Kaplan
Michigan Univ., Ann Arbor. Hwy. Safety Res. Inst.
CONTRACT DOT-HS-031-2-350
Rept. No. UM-HSRI-SA-73-4 ; 1974 ; 238p refs
Report for May 1972 - Jun 1973.
Availability: NTIS

HS-801 146

MULTIDISCIPLINARY ACCIDENT INVESTIGATION. FINAL REPORT

Some 116 fatal motor vehicle accidents in the Boston area are examined in a multidisciplinary in-depth investigative study. The precrash, crash, and postcrash findings are analyzed for the environmental, vehicular, and human factors of each case investigation. The methodology used in the investigations is detailed along with fasciculated results of the factors, evaluation of the Federal Motor Vehicle Safety Standards, and conclusions and recommendations. Recommendations are offered regarding trees and utility poles, sign support poles, guardrails, roadway alignment, pavement markings, vehicle defects, crashworthiness, hoods and windshields, tires, instrument panels, safety standards, cargo securement, drinking drivers, speed, seat belt usage, heart attacks, driver education, police and fire personnel training.

by H. M. Robinson
Boston Univ., Mass. Traf. Accident Res. Proj.
CONTRACT FH-11-7402
Rept. No. BUTAR-FR-5 ; 1974 ; 337p 6refs
Report for 1 Mar 1968 - 15 Dec 1972.
Availability: NTIS

HS-801 150

MATHEMATICAL RECONSTRUCTION OF ACCIDENTS--ANALYTICAL AND PHYSICAL RECONSTRUCTION OF TEN SELECTED HIGHWAY ACCIDENTS. INTERIM REPORT

Ten actual highway accidents have been mathematically reconstructed in a process comprised of two parts. First, trajectories of the vehicles were reconstructed from physical evidence observed at the scene, using a computer simulation of a two-vehicle, planar collision. Next, the responses of the right front occupant of the subject vehicle were reconstructed from observed internal vehicle damage and passenger injuries, using the predicted vehicle crash history and a nonplanar mathematical model of the crash victim. The predicted vehicle trajectories are in general agreement with on-site observations for nine of the 10 cases, and in seven cases the predicted occupant responses generally agree. Predicted values of head injury indicators in current use do not correlate significantly with observed injuries as measured by the 10-point scale, but they do

fall largely within the broad envelope of corresponding windshield impact test results. The 10 accident cases were physically reconstructed on an impact sled, and the results of most of the sled tests agree generally with observations from the actual crash and the results from the analytical reconstructions of crash victim responses. Differences are traceable to several factors, including uncertainties in the vehicle crash history; uncertainties in occupant position, orientation, and muscular response; differences in size between the actual and simulated occupants; and differences in material properties and geometry between the actual and simulated vehicle interiors. Measured values of the head severity index show no distinct correlation with the observed injuries measured on the 10-point scale, but a correlation is shown to exist between observed injury and predicted vehicle speed change.

by J. A. Bartz; R. R. Mchenry; D. J. Segal
Calspan Corp., Buffalo, N. Y.
CONTRACT DOT-HS-053-3-658
Rept. No. ZQ-5341-V-1 ; 1974 ; 283p 20refs
Report for Jun 1973 - Mar 1974.
Availability: NTIS

HS-801 152

ANALYSIS OF TRUCK AND BUS HANDLING. VOL. 1. SUMMARY REPORT

The handling dynamics of an intercity bus and a 3 axle straight truck are investigated using analytical and experimental techniques. Nonlinear equations of motion are derived and implemented as digital computer simulations. A set of commercial vehicle handling test procedures are evolved and used in a series of full scale experiments to measure the handling performance of the example vehicles and verify the computer simulation. Forms of limit performance are observed and analyzed including rollover, plowout (understeer), and spinout (oversteer). The nominal and limit response properties for a given vehicle depend on maneuver severity and test conditions, and the latter include various steer and brake inputs, forward velocities, vehicle loadings, and pavement coefficients (wet and dry). The truck has a 2700 gallon, cylindrical, clean bore tank and liquid cargo slosh effects are studied in the simulation and full scale tests. Test procedures are evolved, handling parameters are identified, the effects of configuration and test variables are quantified, and the response and performance properties of the example commercial vehicles used are established.

by D. H. Weir; G. L. Teper; R. H. Hoh; R. W. Humes; C. S. Sihilling; L. G. Hofmann
Systems Technology, Inc., Hawthorne, Calif.
CONTRACT DOT-HS-242-2-421
Rept. No. STI-1022-1 ; 1974 ; 29p 5refs
Report for Jun 1972 - Mar 1974. Vol. 1 of 2. See also HS-801 153
Availability: NTIS

HS-801 153

ANALYSIS OF TRUCK AND BUS HANDLING. VOL. 2. FINAL REPORT

The handling dynamics of an intercity bus and a three-axle straight truck were investigated using analytical and experimental techniques. Nonlinear equations of motion were derived and implemented as digital computer simulations. These provide for coupled large amplitude lateral and longitu-

dinal motions; steering, braking and throttle inputs; and non-linear tire properties. A set of commercial vehicle handling test procedures were evolved and used in a series of full scale experiments to measure the handling performance of the example vehicles and verify the computer simulation. Various forms of limit performance were observed and analyzed including rollover, plowout (understeer), and spinout (oversteer). The nominal and limit response properties for a given vehicle depended on maneuver severity and test conditions, and the latter included various steer and brake inputs, forward velocities, vehicle loadings, and pavement coefficients (wet and dry). The truck has a 2700-gallon, cylindrical, clean bore tank, and liquid cargo slosh effects were studied in the simulation and full scale tests. Overall, the investigation served to evolve test procedures, identify handling parameters, quantify the effects of configuration and test variables, and establish the response and performance properties of the example commercial vehicles used.

by D. H. Weir; G. L. Teper; R. H. Hoh; R. W. Humes; C. S. Sihilling; L. G. Hofmann
Systems Technology, Inc., Hawthorne, Calif.
CONTRACT DOT-HS-242-2-421
Rept. No. STI-1022-1 ; 1974 ; 407p 15refs
Report for Jun 1972 - Mar 1974. Vol. 2 of 2. See also HS-801 152
Availability: NTIS

HS-801 154

PERFORMANCE EVALUATION OF THE HIGHWAY SAFETY RESEARCH INSTITUTE (HSRI) ANTHROPOMORPHIC TEST DUMMY. INTERIM TECHNICAL REPORT

The performance of a 50th percentile anthropomorphic test dummy is tested. Two identical dummies were furnished for: measurement and verification of the degree of conformance with a "Purchase Description of the NHTSA 50th Percentile Anthropomorphic Test Dummy", and establishment, by appropriate testing, of the ranges of performance and repeatability of the test devices under conditions of representative crash environments. A series of 11 static and dynamic component tests were performed and the results indicate substantial non-conformance with the specified criteria. Fourteen type-2 belt restraint tests and six air bag restraint tests were performed using an accelerator sled to simulate a 30 mph impact crash. The results indicate that the dummy responses differ substantially from those of the General Motors Hybrid II dummy. Further, the repeatability of the HSRI dummy is substantially equivalent on an overall basis when compared to the GM Hybrid II dummy.

by K. N. Naab; D. E. Massing
Calspan Corp., Buffalo, N. Y.
CONTRACT DOT-HS-053-3-664
Rept. No. ZS-5352-V-1 ; 1974 ; 375p 1ref
Report for Jun 1973 - Jan 1974.
Availability: NTIS

HS-801 162

ADVANCED AIR BAG RESTRAINTS FOR STANDARD SIZE CAR DRIVERS. VOL. 1: EXECUTIVE SUMMARY. FINAL REPORT

The effort to develop an advanced air bag restraint system for standard size cars capable of protecting the driver in frontal and/or frontal oblique crashes is summarized. A system is described consisting of a small, quickly-inflating double air bag, an energy absorbing steering column mechanically stroking through rollerless tapes, a mechanically stroking padded knee restraint linked to the steering column, an energy absorbing seat assembly, and compartment padding. The system is capable of protecting drivers throughout the adult anthropometric range at velocities to 50 mph as tested in sled simulated frontal, pitching, and angular impacts representing actual collisions. The design minimized structural modifications necessary to achieve the desired impact performance. Based on the results of 182 sled tests, it is recommended that an operational air bag, stroking column, knee restraint, and energy absorbing seat and interior padding be developed and tested in standard cars.

by D. Friedman; K. Friedman
Minicars, Inc., Goleta, Calif.
CONTRACT DOT-HS-113-2-441
1974 ; 30p
Report for 1 Jul 1972 - 28 Feb 1974. See also HS-801 173
Availability: NTIS

HS-801 164

UTAH MULTIDISCIPLINARY HIGHWAY CRASH INVESTIGATION. VOL. 2. FINAL REPORT

Findings, methodology, recommendations and summaries of 40 in-depth multidisciplinary accident investigations conducted by the Utah Auto Crash Research Team are given. Objectives were to identify pertinent factors (human, vehicular, and environmental) which contribute to the causation of motor vehicle accidents; identify injury-causing or attenuating factors; evaluate the effectiveness of countermeasures evolved by NHTSA, particularly those outlined in the motor vehicle and traffic safety program standards; identify early design and functional problems of the motor vehicle and highway; determine the effects of aging and vehicle maintenance and the value of vehicular inspection programs; evaluate driver education and enforcement programs; and develop medical and engineering students in this area of applied research.

by J. T. Weston; F. R. Wagner
Utah State Div. of Health, Salt Lake City
CONTRACT FH-11-7221
1974 ; 276p refs
Rept. for 30 May 1970-28 Feb 1971.
Availability: NTIS

HS-801 166

UTAH MULTIDISCIPLINARY HIGHWAY CRASH INVESTIGATIONS. FINAL REPORT

The third phase of the multidisciplinary accident investigation program conducted in metropolitan Salt Lake City is reported, with findings summarized of the investigation of 41 serious ac-

cidents conducted during the period March 1, 1971 through March 15, 1972. A summary of each case study is included.

by J. T. Weston; C. V. Nakaishi
Utah Univ., Salt Lake City
CONTRACT DOT-HS-047-1-063
1974 ; 307p
Report for 1 Mar 1971-15 Mar 1972.
Availability: NTIS

HS-801 168

EXPERIMENTAL DETERMINATION OF MECHANICAL FEATURES OF ADULTS AND CHILDREN. FINAL REPORT

Methods for acquiring comprehensive body form and biomechanical data for use in mathematical modeling of traffic accidents are examined, with 21 children and five adults serving as subjects. Automatic data acquisition systems, based on the principles of biostereometrics, were used to obtain a wide range of body form and biomechanical data, including: three-dimensional coordinates and cross sections for major body parts and the body as a whole; volume distribution curves for major body parts and the body as a whole; perimeter distribution curve; linear anthropometric dimensions; estimates for surface area, volume, center of gravity and inertial tensors for major body parts and the body as a whole, and globographic data for all major joint sinuses. A booklet containing guidelines for the standardization of body form and joint sinus data using biostereometric methods was developed. The study demonstrates that biostereometrics can help overcome the current lack of comprehensive three-dimensional body geometry and related human mass distribution data necessary for exploring the growing mathematical modeling potential of modern computers and for designing more realistic mannequins to serve the needs of traffic safety engineering.

by R. E. Herron; J. R. Cuzzi; D. V. Goulet; J. E. Hugg
Texas Inst. for Rehabilitation and Res., Houston.
Biostereometrics Lab.
CONTRACT DOT-HS-231-2-397
1974 ; 176p 146refs
Rept. for May 1972-Feb 1974.
Availability: NTIS

HS-801 177

CORRELATION ROAD TEST. FINAL REPORT

Tests were conducted to determine the road performance and life of tires (Motor Vehicle Safety Standard 109 Test. Programmed Faults New) New0 determined to have anomalies by non-destructive test techniques. Results of the tests were used to determine the tires' relation to highway safety, to evaluate non-destructive testing as a tool, and to supply a data base for updating MVSS109. Limited correlation was obtained between non-destructive tests and deficiencies found by cutting the tire. The method of non-destructive testing was capable of predicting tire failure mode to a qualified level of reliability.

by T. E. Smith
Nevada Automotive Test Center, Carson City
CONTRACT DOT-HS-064-3-687
1974 ; 349p 1ref
Rept. for Jun 1973-May 1974.
Availability: NTIS

HS-801 206

PRESSURE EFFECTS ON WORN PASSENGER CAR TIRE CARCASSES. (PRELIMINARY REPORT). INTERIM REPORT

The value of hydrostatic proof pressure testing on selected used tire carcasses for retreading is examined. Preliminary experiments on single tire cords indicate that overloads close to rupture do not damage subsequent fatigue life. A selected population of used 15 in. passenger car tires was burst hydrostatically, yielding a wear burst pressure of 207 psi. Additional tires are to be retreaded after pressurization to 170 psi. Their performance on MVSS 109 will be compared with an unpressurized control set of tires which are also to be recapped. It was found that tire construction affected both the most probable location of failure and the average burst pressure. Tire types tested were two- and four-ply bias, rayon-rayon bias belted, polyester-fiberglass bias belted, and radial ply tires. Acoustic emission, the spontaneous generation of an energy within a material, was found to be present in hydrostatically pressurized tires.

by S. K. Clark; R. N. Dodge; D. W. Lee; J. Luchini
Michigan Univ., Ann Arbor
CONTRACT DOT-TSC-316
Rept. No. um-010654-2-I; DOT-TSC-74-1 ; 1974 ; 36p
Availability: NTIS

HS-820 294

BASIC COURSE IN HIGHWAY TRAFFIC RECORDS. COURSE GUIDE

A course guide is presented which gives a generalized picture of the Traffic Records Course, describes the student population for whom it is intended, and guides the course administrators and potential instructors in preparing for its presentation. Major areas of concern are: program objectives; instructional resources; course structure, content, and objectives; and course presentation, in terms of scheduling, instructor and other staff requirements, instructional resources, and physical arrangements.

Computer Sciences Corp., Falls Church, Va.
CONTRACT DOT-HS-134-2-498
1974 ; 41p
Availability: GPO \$0.85

HS-820 295

BASIC COURSE IN HIGHWAY TRAFFIC RECORDS. INSTRUCTOR'S GUIDE

An instructor's guide for a basic course in highway traffic records is presented which examines the course content module by module. Topics covered include: traffic records in perspective; concepts of an integrated traffic records system; data subsystems for crash, driver, vehicle, roadway, emergency services, traffic law enforcement and adjudication, educational services, and safety program management; and evaluative research in the highway safety program. Classroom aids are also included.

Computer Sciences Corp., Falls Church, Va.
CONTRACT DOT-HS-134-2-498
1974 ; 273p refs
Availability: GPO \$2.80

HS-820 296

BASIC COURSE IN HIGHWAY TRAFFIC RECORDS. STUDENT GUIDE

A student guide is presented which introduces the basic concepts of an integrated state traffic records system. Concepts of an integrated records system are first outlined, followed by descriptions of various data subsystems (crash, driver, vehicle, roadway, emergency services, traffic law enforcement and adjudication, educational services, and safety program management). The role of evaluative research in the highway safety program is also discussed. Classroom problems are included.

Computer Sciences Corp., Falls Church, Va.
CONTRACT DOT-HS-134-2-498
1974 ; 119p
Availability: GPO \$1.55

HS-820 300

HIGHWAY SAFETY WORKSHOP FOR TRAFFIC COURT JUDGES. TRAINER'S MANUAL

A trainer's manual is presented which gives trainers all necessary materials for the successful implementation of the Highway Safety Workshop, designed around a developmental sequence. The workshop activities include: discussion of specific aspects of the highway safety problem: possible solutions for a reduction in the court case load that would allow the court to concentrate its resources on the problem driver; a film depicting the drinking driver problem and possible solutions to it within the community; alcohol usage countermeasures; and the systems approach to highway safety, dealing with driver behavior, road design, vehicle condition, etc.

Abt Associates, Inc., Cambridge, Mass.; National Hwy. Traf. Safety Administration, Washington, D. C.
1973 ; 167p 69refs
Availability: GPO

HS-820 301

HIGHWAY SAFETY WORKSHOP FOR TRAFFIC COURT JUDGES. PARTICIPANT'S REFERENCE MANUAL

A participant's reference manual is presented for a highway safety workshop for traffic court judges. Sample discussion questions are given along with research abstracts related to them. Complexities in the traffic court judge's role are examined and suggestions are offered for reducing the court case load and for devoting resources to areas where his judgments will have the maximum positive effect. Problems of drinking drivers are reviewed and countermeasures are recommended, including fines, probation, educational programs, in- or out-patient treatment, and an alcoholism treatment release program operated through a county jail. A case history of a drinking driver is included.

Abt Associates, Inc., Cambridge Mass.; National Hwy. Traf. Safety Administration, Washington, D. C.
1973 ; 94p refs

DEVELOPMENT OF A NATIONAL ITEM BANK FOR TESTS OF DRIVING KNOWLEDGE. FINAL REPORT

Materials for driving knowledge test development use by operational and licensing and education agencies were prepared. Candidate test items were developed, using literature and operational practice sources, to reflect current state-of knowledge with respect to principles of safe efficient driving, legal regulations, and traffic control devices. Such multiple-choice item pools were developed for testing drivers of passenger cars and light trucks, motorcycles, and buses and trucks. Subsequent to item review by batteries of highway safety experts, field tests to collect psychometric, normative, and validation data for the passenger car and light truck items were conducted, along with similar evaluations and tests for motorcyclists. An operational manual is provided.

by W. T. Pollock; T. L. McDole
Michigan Univ., Ann Arbor. Hwy. Safety Res. Inst.
CONTRACT FH-11-7616
Rept. No. HSRI-001590-2 ; 1974 ; 319p refs
Rept. for Jul 1970-Sept 1973.
Availability: NTIS

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